

7.0 Permit Requirements

F. Watershed Assessment and Planning

Baltimore County shall continue to update and revise watershed assessments that have been developed for its 10 urban watersheds (Baltimore Harbor, Bird River, Back River, Gwynns Falls, Jones Falls, Little Gunpowder, Loch Raven, Lower Gunpowder River, Middle River, and the Patapsco River). The overall goal is to ensure that each County watershed is thoroughly evaluated and has an action plan to maximize water quality improvements. Additionally, the County shall encourage the public to participate in the development and implementation of watershed restoration activities. At a minimum, the County shall:

1. Continue to perform and update detailed assessments in all of its urban watersheds. These watershed assessments shall include:
 - a. Determining current water quality conditions;
 - b. Identifying and ranking water quality problems;
 - c. Identifying all structural and non-structural water quality improvements opportunities;
 - d. Reporting the results of a visual watershed inspection;
 - e. Specifying how the restoration efforts will be monitored; and
 - f. Providing an estimated cost and a detailed implementation schedule for those improvement opportunities identified above.
2. By 6/15/2006, the County shall complete the prioritization process for selecting subwatersheds for restoration started during the previous permit term. These subwatersheds shall contain at least 20% of the County's impervious cover. Restoration efforts resulting from this prioritization process shall be in addition to typical stormwater management facility maintenance; and
3. By the end of this permit term, the County shall propose for restoration subwatersheds containing another 10% of the County's impervious surface area with poor or no stormwater management. These sub-watersheds shall be in addition to the 20% already proposed for restoration under the requirements above.

G. Watershed Restoration

The County shall implement those practices identified in Part III. F. above to control stormwater discharges to the maximum extent practicable. The overall goal is to maximize the water quality in the County's urban watersheds, using efforts that are definable and the effects of which are measurable. At a minimum, the County shall:

1. Complete the implementation of those restoration efforts that were identified and initiated during the previous permit term to restore 10% of the County's impervious surface area.
2. Within one year of permit issuance, begin to implement restoration of an additional 10%

of the County's impervious surface area. .

3. Annually, Baltimore County shall update its impervious surface restoration accounting sheets for each of its urban watersheds. At a minimum, these data shall include:
 - a. Total impervious acres for each urban watershed;
 - b. A schedule and cost estimate for the design, construction, and completion for each retrofit project;
 - c. The impervious acres controlled or restored within each watershed; and
 - d. The monitoring data and surrogate parameter analyses used to determine water quality improvements.

J. Total Maximum Daily Loads

Stormwater BMPs and programs implemented as a result of this permit must be consistent with available waste load allocations (WLA's)[see 40 CFR122.44(d)(1)(vii)(B)] developed under a Total Maximum Daily Load (TMDL). MDE has determined that owners of storm drain systems that implement the requirements of this permit will be controlling stormwater pollution to the maximum extent practicable. Therefore, satisfying the conditions of the permit will meet WLA's specified in TMDL's developed for impaired water bodies. If assessment of the stormwater management program indicates TMDL WLAs are not being met, additional or alternative stormwater controls must be implemented to achieve WLAs.

7.1 Introduction

Environmental consultants managed by the Department of Environmental Protection and Resource Management (DEPRM) – Watershed Management and Monitoring Section have prepared watershed management plans for 10 of the 14 8-digit watersheds located in Baltimore County. The remaining four watersheds do not have significant urban components and therefore are not required to have watershed management plans for this permit. These watershed management plans and the four watersheds that do not have plans will be enhanced through the creation of Action Plans that will set restoration goals, identify steps to achieve those goals, provide an implementation schedule and a monitoring plan. The Action Plans will be prepared with the input from stakeholders within the planning area and identify opportunities for citizen based watershed restoration. The Action Plans will include the identification of potential stormwater management conversion sites, capital projects, as well as citizen based stream restoration opportunities, operational program implementation, and an implementation schedule. DEPRM has compiled a list of qualified on-call consultants which will be used to assist with the development of the SWAPs.

This chapter includes updates on the status of the watershed management plans and Small Watershed Action Plans (SWAPs) (sec. 7.2), pollution reduction calculations (sec. 7.3), Capital Improvement Program's (CIP) restoration projects (sec. 7.4, 7.5), Community Reforestation Program efforts (sec. 7.6), Watershed Associations (sec. 7.7) and additional restoration efforts such as the Growing Home Campaign and Tree-Mendous Maryland (sec. 7.8).

Although the major focus of the implementation of the watershed management plans centers on capital projects, this component cannot alone satisfy water quality improvement. In Baltimore County water quality improvement is a multi-faceted effort involving other components such as

sediment control, storm drain inlet cleaning, street sweeping, recycling, solid & hazardous waste management, illicit connection reduction, citizen education, sanitary sewer system infiltration/exfiltration reduction and others. These County-wide programs are described in other sections of this report.

The County's capital budget includes the current budget year and the subsequent 5 years. The capital budget is on a two-year cycle tied to bond referenda. Additional funding for these projects is sought after through state and federal grant funding programs. Section 11 details the entire funding budget for watershed planning and restoration implementation in Baltimore County.

7.2 Status of Watershed Management Plans

7.2.1 Water Quality Management Plans

Water quality management plans have been completed for ten of the fourteen major watersheds in Baltimore County. The four remaining watersheds have limited urban development and therefore are not required by the NPDES – Municipal Stormwater Discharge Permit to have water quality management plans. However, recognizing the benefits of a watershed management plan, Baltimore County has completed the development of a Prettyboy Watershed Plan under the State's Watershed Restoration Action Strategy (WRAS) process. Harford County in conjunction with stakeholders has also completed the WRAS process to develop a watershed plan for Deer Creek watershed. Table 7-1 presents the watersheds and the year of completion of the water quality management plan. The Gwynns Falls Watershed Management Plan, completed in December 2004, was a cooperative effort between Baltimore County and Baltimore City.

Table 7-1: Status of Watershed Management Plans

Watershed	Watershed Plan Status	Completion Date
Upper Western Shore		
Deer Creek	WRAS	6/30/07
Prettyboy Reservoir	WRAS	1/4/08
Loch Raven	Complete	9/30/96
Lower Gunpowder Falls	Complete	9/30/98
Little Gunpowder River	Complete	3/31/02
Bird River	Complete	3/29/96
Gunpowder River	Not Required	
Middle River	Complete	3/30/01
Patapsco/Back River		
Liberty Reservoir	Not Required	
Patapsco	Complete	9/30/98
Gwynns Falls	Complete	12/1/04
Jones Falls	Complete	9/30/96
Back River	Complete	9/30/96
Baltimore Harbor	Complete	3/30/01

Baltimore County enlisted the services of consultants for the preparation of the Watershed Management Plans. While the details of each plan vary, a common framework is incorporated into each plan. This framework includes:

1. watershed modeling using US EPA Stormwater Management Model (SWMM);
2. stream stability assessment using Rosgen classification methodology Levels I,II,III;
3. identification and ranking of water quality problems;

4. development of non-point source control management strategies;
5. prioritization of programs and projects; and
6. preparation of the final document, integrating the above tasks and preparing maps and tables to relate results.

Two of the water quality management plans (Middle River and Baltimore Harbor) did not include a stream stability assessment due to the limited mileage of open stream channels. These two plans did, however, include tidal estuarine water quality models, which were not a component in any of the other plans. The completed water quality management plans have been previously submitted to MDE and may be reviewed for greater detail.

7.2.2 Small Watershed Action Plans (SWAPs)

In 2005, Baltimore County initiated a new round of watershed planning, entitled Small Watershed Action Plans (SWAPs). The SWAP planning process is meant to bring together the many mandates that the County is charged to meet in each individual watershed, including the requirements of the NPDES – Municipal Stormwater Discharge Permit, Total Maximum Daily Loads (TMDLs), goals in the Chesapeake 2000 and the Tributary Strategies, the Reservoir Management Program and the Baltimore Watershed Agreement. The forthcoming Chesapeake Bay TMDL will also be addressed in future SWAPs. The small watershed action planning process is designed to bring all these individual mandates together at a subwatershed level that will help residents understand the intent of each program, how to most efficiently meet the goals, and define the roles of the partners. The SWAPs will build on the previously completed technical Water Quality Management Plans listed in Section 7.2.1.

Stakeholders are invited to participate in the development of each SWAP. A series of three meetings are held over the course of the development of each SWAP. The first introduces the stakeholders to the process and solicits their input on the characterization of the planning area and goals. The second meeting presents the final characterization document and solicits input on preferred restoration options. The third meeting presents the SWAP, which includes not only County actions and projects, but also citizen based and business based restoration activities and options. Planning areas were selected on similarity of impacts within each area, allowing focus on specific issues related to the stakeholders that live and work within each planning area. Twenty-three planning areas have been delineated.

The Tidal Back River SWAP was completed in February 2010 in conjunction with the Back River Restoration Committee (BRRC). The Lower Jones Falls and Upper Back River SWAPs were completed in the fall of 2008 with funding from an U.S. Environmental Protection Agency – Region III Water Quality Cooperative Assistance grant. This funding permitted the hiring of contractual staff and the Center for Watershed Protection to assist in the development of the Action Plans. These two SWAPs were developed in conjunction with Baltimore City, Herring Run Watershed Association, and Jones Falls Watershed Association. A Watershed Restoration Action Strategy (WRAS) was developed in January 2008 for the Prettyboy watershed. This was in partnership with DNR, MDE, Carroll County, York County PA, the Soil Conservation Districts, and the Prettyboy Watershed Alliance. These same organizations are continuing with semi-annual meetings to follow-up on implementation of the plan. Figure 7-1 shows the planning areas and schedule.

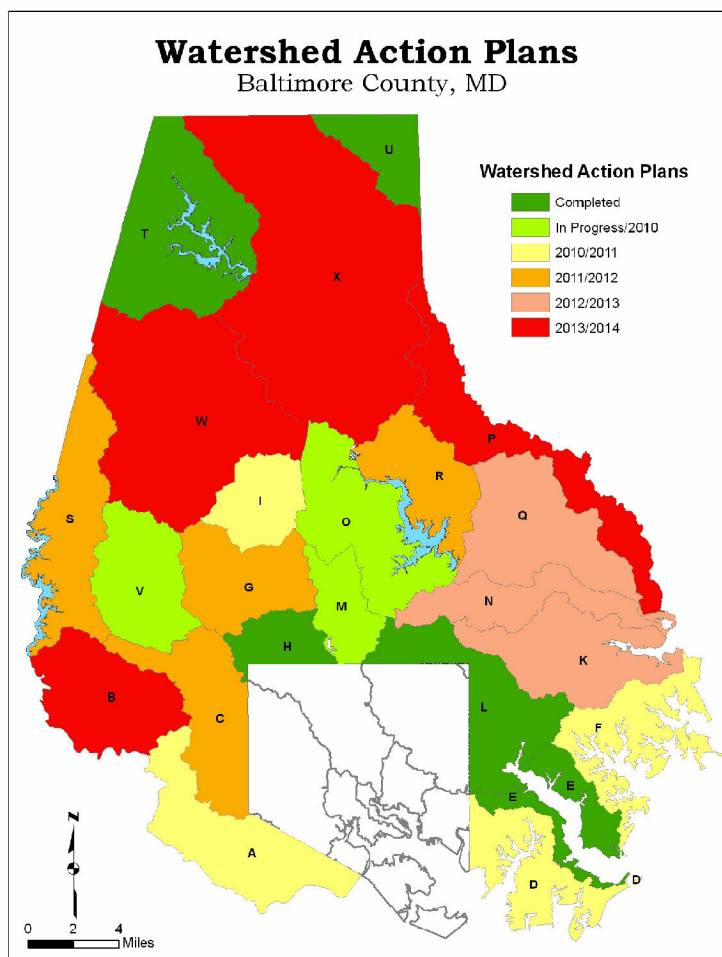


Figure 7-1 Baltimore County SWAPs

Three SWAPs are currently under development. The SWAP Area O in the Loch Raven Watershed and the Northeastern Jones Falls SWAP (M) are being completed in-house by DEPRM staff. A consultant under contract is completing the Upper Gwynns Falls SWAP (V). These three active SWAPs will be completed in late 2010/early 2011. The Lower Patapsco SWAP (A) in the Patapsco River Watershed is on hold until late in 2010 and will also be completed by a contracted consultant. The Gunpowder Valley Conservancy, the Jones Falls Watershed Association and the Friends of the Patapsco Valley will all be assisting DEPRM and the consultants with the plans for their respective watersheds. Table 7-2 details the SWAPs schedule and indicates whether the SWAP will be completed in-house by DEPRM staff or contracted to a consultant.

Table 7-2 SWAP Schedule

Watershed	SWAP Area	Acres	Completed By:	Anticipated Completion
Patapsco	A	17,569	Consultant	2011
Patapsco	B	15,761	Consultant	2014
Gwynns Falls	C	14,884	Consultant	2012
Balt Harbor	D	11,484	Consultant	2011
Back River	E	7,858	Consultant	Complete
		6,520		

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Jones Falls	G	13,187	Consultant	2012
Jones Falls	H	5,777	DEPRM/Consultant	Complete
Loch Raven	I	8,350	Consultant	2011
Bird River	K	22,528	Consultant	2013
Back River	L	15,385	DEPRM	Complete
Jones Falls	M	6,957	DEPRM	2010
Lower Gunpowder	N	10,553	Consultant	2013
Loch Raven	O	17,523	DEPRM	2010
Little Gunpowder	P	17,217	Consultant	2014
Lower Gunpowder	Q	18,931	Consultant	2013
Loch Raven	R	11,466	Consultant	2012
Liberty Reservoir	S	16,449	Consultant	2012
Prettyboy Reservoir	T	24,027	DEPRM	Complete
Deer Creek	U	7,132	Harford County	Complete
Gwynns Falls	V	13,618	Consultant	2010
Loch Raven	W	38,515	Consultant	2014
Loch Raven	X	61,436	Consultant	2014

7.3 Obtaining Pollution Reduction Numbers

There are many types of restoration projects completed by DEPRM and the local watershed associations that result in quantifiable pollution reduction. This section details how these numbers are obtained.

7.3.1 Stream Restoration

The calculation of pollutant load reductions resulting from stream restoration were based on the re-analysis of the Spring Branch data presented in the NPDES 2006 Annual Report, which resulted in the following pollutant load reduction estimates:

- Total Nitrogen – 0.202 pounds per linear foot of stream restoration
- Total Phosphorus – 0.0107 pounds per linear foot of stream restoration
- Total Suspended Solids – 3.58 pound per linear foot of stream restoration

7.3.2 Shoreline Enhancement

To obtain nutrient reduction numbers associated with shoreline enhancement projects, it must be determined how much sediment the project is theoretically preventing from entering a waterway. To calculate an estimate of annual erosion at a given shoreline site, the equation $V = LEB$ is used, where 'V' is volume eroded, 'L' is length of shoreline, 'E' is erosion rate and 'B' is bank height. This equation yields a volume expressed in cubic feet per year. Cubic feet are converted to pounds using a soil bulk density of 93.6 lb/ft³. Pounds are then converted to tons using a factor of 0.0005. Lengths of shoreline and bank heights are taken from engineering and project plans prepared by consultants for Baltimore County and erosion rates from Department of Natural Resources website, <http://shorelines.dnr.state.md.us> are used.

Nitrogen and Phosphorus loading rates for shorelines are taken from *Eroding Bank Nutrient Verification Study for the Lower Chesapeake Bay* (Ibison, 92). The mean total N and total P loading concentrations in the study are 0.73 lb/ton and 0.48 lb/ton respectively (p. 44).

7.3.3 Stormwater Retrofits

Drainage areas for stormwater management facilities are delineated to determine the acreage on which to apply the pollution reduction efficiencies shown in Table 7-3. Some of the efficiencies used have changed from last year's Chesapeake Bay Program (CBP) model 4.3 to this year's model 5.3, and those changes are shown in the table. Efficiencies are applied to pollutant loads based on land use of these drainage areas.

Table 7-3 Percent Removal Efficiency of BMPs

BMP	Pollutants					
	TN		TP		TSS	
	2009	2010	2009	2010	2009	2010
Detention Facilities	5		10		10	
Extended Detention Facilities	30	20	20		60	
Wet Ponds	50	20	50	45	80	60
Infiltration Practices	50	85	70	85	90	95
Filtration Practices	40		60		85	80
Detention Facilities = Detention Pond and Hydrodynamic Devices						
Extended Detention Facilities = Extended Detention Ponds						
Wet Ponds and Wetlands = Wet Pond and Shallow Marsh						
Infiltration Practices = Infiltration Trench and Infiltration Basins, Porous Paving, and Dry Wells						
Filtration Practices = Sand filters and Bioretention Facilities						

Section 10.2 describes the calculation of pollutant loads for individual watersheds and for the drainage area to stormwater management facilities. The pollutant load reductions for stormwater management facility retrofits and conversions uses the loads calculated in accordance with Section 10.2 and the pollutant removal efficiencies based on facility type found in Table 7-3.

7.3.4 Community Reforestation Program

Baltimore County's reforestation program plants trees on public and private land, in stream buffers and open areas (also see sec. 7.6). Nutrient reductions associated with buffer plantings are obtained using the sum of a reduction efficiency and a land use change. A reduction efficiency of 25% for Nitrogen and 50% for Phosphorus is applied to the area planted. This represents a change from last year's calculations where the efficiencies were applied to 4X the area planted for nitrogen and 2X the area planted for phosphorus. The land use change is from a pervious urban nutrient load to a forested nutrient load, using loading rates from the Phase 5.2 Chesapeake Bay Program (CBP) Model. Table 7-4 shows these loading rates. Open area plantings (non-buffer) use only the land use change to calculate load reductions.

Table 7-4 CBP Nutrient Loading Rates

	N Above Fall Line (lbs/yr)	N Below Fall Line (lbs/yr)	P Above Fall Line (lbs/yr)	P Below Fall Line (lbs/yr)
Pervious Urban	7.25		0.43	
Impervious Urban	14.1		2.26	
Forested	1.41	1.29	0.02	

7.3.5 Activities of Volunteer Organizations

Many of the activities that local watershed groups and their volunteers engage in have nitrogen and phosphorus reducing capabilities, also see sec. 7.7. Loading rates and reduction efficiencies from the Phase 5.3 CBP Watershed Model, were used to determine nutrient reduction numbers for the following Best Management Practices (BMPs):

- Downspout Disconnection & Rain Barrels - Rooftop acres disconnected is estimated and the loading rate for impervious urban (see Table 7-4) is applied to this acreage. At this time, these two BMPs are classified as ‘infiltration’ practices (see Table 7-3).
- Rain Gardens - Rain gardens drain specific areas of pervious and/or impervious surface. By using the nutrient loading rates in Table 7-4 and applying the ‘infiltration’ reduction efficiencies from Table 7-3 to these loads, nutrient reduction numbers for rain gardens can be determined.
- Stream Buffer Tree Plantings - Nutrient reductions associated with buffer plantings are obtained using the sum of a reduction efficiency and a land use change. See sec. 7.3.4.
- Street Tree/Open Space Plantings - Land use conversion from pervious urban acres to forested acres described in sec. 7.3.4 is used to determine nutrient reduction.

7.4 Capital Restoration Projects - Upper Western Shore Watersheds

The Upper Western Shore watersheds include: Deer Creek, Prettyboy Reservoir, Loch Raven Reservoir, Lower Gunpowder Falls, Little Gunpowder Falls, Bird River, Gunpowder River and Middle River. Five of the eight watersheds require watershed management plans based on NPDES requirements on the amount of urban development within the watershed. These plans have been completed.

7.4.1 Deer Creek

Due to the rural nature of this watershed a watershed management plan is not required by the NPDES – Municipal Stormwater Discharge Permit. Baltimore County’s portion of this watershed is approximately eleven square miles. There are no capital improvement projects currently planned for this watershed. Deer Creek is part of the Susquehanna River Basin. The predominate land use in the watershed is agriculture. A Deer Creek WRAS was prepared by Harford County. Baltimore County participated in that effort.

7.4.2 Prettyboy Reservoir

The Prettyboy Reservoir serves as a holding reservoir for the Loch Raven Reservoir. When the Loch Raven Reservoir water levels are low, water is released from Prettyboy Reservoir to maintain the levels in Loch Raven. Water is also released from Prettyboy Reservoir during the summer to maintain the low temperatures necessary to support the trout fishery in Gunpowder Falls.

The Prettyboy Reservoir watershed in Baltimore County is approximately thirty-seven square miles. Its predominate land uses are agriculture and forest. The Prettyboy Reservoir watershed has been listed as impaired by Maryland Department of the Environment for nutrients, mercury in fish tissue, heavy metals and bacteria. In 2003 a Water Quality Analysis for heavy metals, that indicated no impairment was submitted to EPA and approved. A copy of the document can be found on the web at:

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http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_prettyboy_final_metals.asp

A TMDL for mercury in fish tissue was prepared and submitted to EPA and approved in 2004. The major source of mercury is from air deposition due to discharges from power plants and incinerators. As such, the major factor in reducing mercury contamination in Prettyboy Reservoir is reductions in emissions, with secondary actions including hazardous waste collection days and “e-cycling”. The document may be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_prettyboy_Hg.asp

The nutrient TMDL for Prettyboy has been prepared and was approved by EPA in March 2007. The TMDL calls for a 54% reduction in Total Phosphorus in order to maintain chlorophyll at below eutrophic levels and to maintain dissolved oxygen above the limit of 5mg/l. It was determined through the modeling effort that reductions in nitrogen would have limited effect on the chlorophyll a and dissolved oxygen concentrations. The document may be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_gunpowder_P_sed.asp - TMDL Prett

The bacteria TMDL was approved by EPA in October 2009 for the Prettyboy Reservoir watershed. The document may be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_prettyboy_bacteria.asp

The 2008 *Integrated Report of Surface Water Quality in Maryland* includes a revised non-tidal stream biological listing criteria. Based on the revised criteria, the Prettyboy Reservoir watershed has been delisted for biological impairment. An examination of the biological data would seem to indicate that while the entire watershed is not biologically impaired, the Prettyboy Branch in the south eastern-portion of the watershed is biologically in a poor condition.

With this budget cycle capital money has been proposed for fiscal years 2010 - 2016 for the design and construction of stream restoration projects as indicated in Table 7-5. DEPRM is currently selecting a stream segment for the first project. Design is to be awarded in 2010. Figure 7-3 shows the locations of these projects.

Table 7-5: Prettyboy Reservoir Watershed – CIP Status

Capital Improvement Projects Prettyboy Reservoir Watershed								
Project	Facility Type	DA (LF)	Cost	Year	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Projects Under Design or Construction								
Projects in the Capital Budget								
Prettyboy Branch SR	SR		900,000	10				
Prettyboy SR	SR		0*	14				
Totals			900,000					

Abbreviations

SR: Stream Restoration

*project is proposed but no funding secured

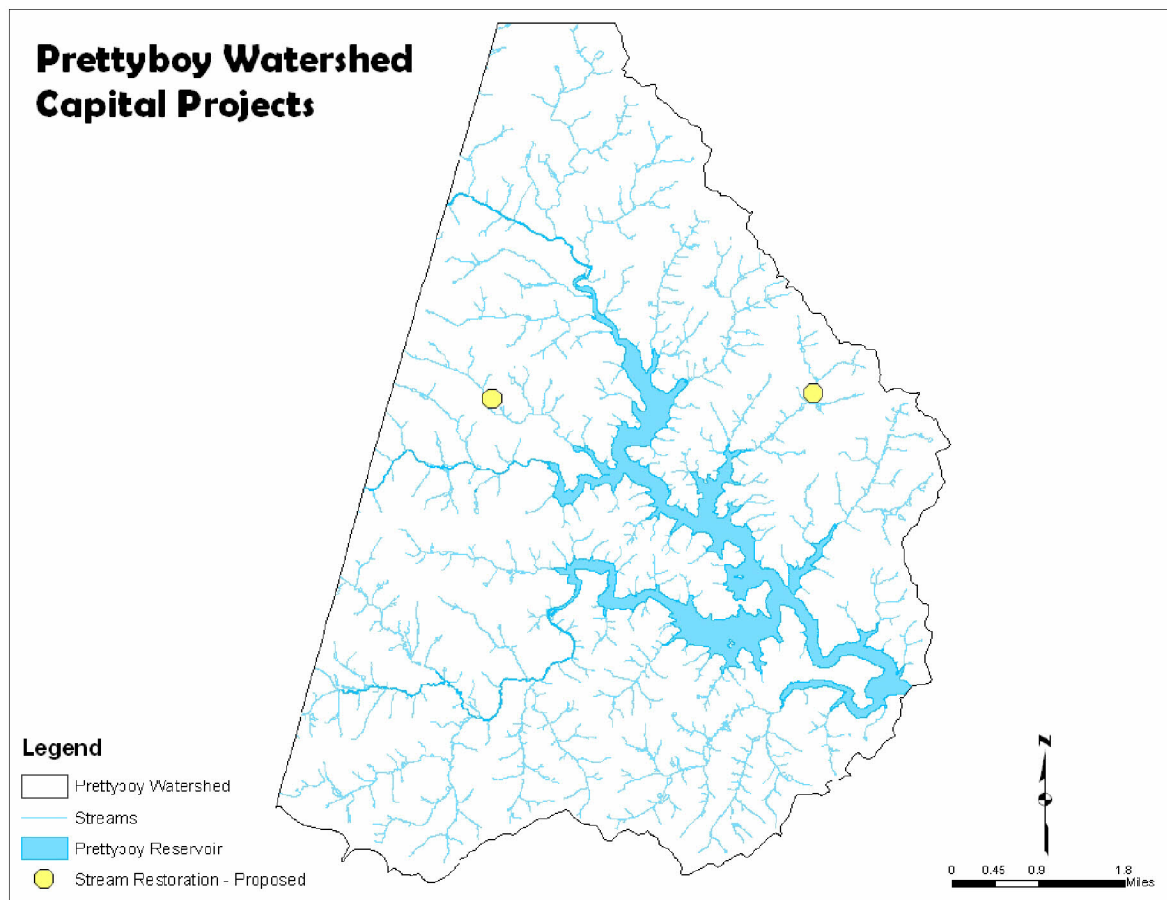


Figure 7-2 Capital Projects in the Prettyboy Watershed

In calendar year 2002 Baltimore County participated in a study that examined this watershed to identify threats to the source water resource. Additional participants in this study included Baltimore City, Trust for Public Lands (TPL), USDA Forest Service, University of Massachusetts, and the Baltimore Metropolitan Council of Governments. GIS was used extensively to target areas for preservation and conservation. A draft report was prepared in November of 2002 and a final one completed in 2003. Residents have organized an environmental organization called the Prettyboy Watershed Alliance and are actively engaged in restoration and resource management activities within the watershed.

The Prettyboy watershed was selected by Maryland Department of the Environment for the preparation of a Watershed Restoration Action Strategy (WRAS). The WRAS was completed in January 2008. The WRAS specifically addressed the nutrient TMDL, along with other stakeholder-identified goals. The completed WRAS can be found on DEPRM's web site at www.baltimorecountymd.gov/go/prettyboy.

To expand the County's overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant Program*. This grant program was

developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

The Prettyboy Watershed Alliance (PWA) has received three grants under this program. The organization uses the funds to increase their membership, expand their base of volunteers, engage citizens with Stream Watch, participate in the Prettyboy WRAS, and develop partnerships with local schools.

7.4.3 Loch Raven Reservoir Watershed

The Loch Raven Reservoir watershed is listed as impaired by heavy metals, mercury, nutrients, sediment, and biological impairments. The 2008 *Integrated Report of Surface Water Quality in Maryland* listed Loch Raven Reservoir watershed as impaired by bacteria, and with the new biological listing criteria listed the entire watershed as biologically impaired, but removed the individual impairment listing for 12-digit watersheds.

A Water Quality Analysis for heavy metals was performed and submitted to EPA for approval. No impairment for heavy metals was found. The document may be found on the web at: http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_loch_raven_final_metals.asp

A TMDL for mercury in fish tissue was prepared and submitted to EPA and approved in 2004. The major source of mercury is from air deposition due to discharges from power plants and incinerators. As such, the major factor in reducing mercury contamination in Loch Raven Reservoir in reductions in emissions, with secondary actions including hazardous waste collection days and “e-cycling”. The document may be found on the web at: http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_lochraven_Hg.asp

The nutrient and sediment TMDLs for Loch Raven Reservoir were approved by EPA in March 2007. As with the Prettyboy Reservoir, Total Phosphorus was found to be the limiting nutrient. The TMDL calls for a 50% reduction in Total Phosphorus and a 25% reduction in sediment. The sediment reduction is intended to extend the longevity of the reservoir by reducing the rate of infilling of the reservoir. The document can be found on the web at: http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_gunpowder_P_sed.asp

A TMDL for bacteria was approved by EPA for the Loch Raven watershed in December of 2009. The document can be found here: http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_Loch_Raven_Reservoir_bacteria.asp

The Loch Raven Reservoir Watershed Management Plan was completed in 1997. The plan has been submitted to Maryland Department of the Environment. The Goodwin Run-Hunt Valley-Loveton SWAP, discussed above will provide the level of detail necessary for meeting a diverse array of environmental goals.

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Table 7-6 presents the status of the capital improvement projects in the Loch Raven Reservoir watershed. The locations of these projects are shown in Figure 7-3.

Table 7-6: Loch Raven Reservoir Watershed – CIP Status

Capital Improvement Projects Loch Raven Reservoir Watershed								
Project	Facility Type	DA (LF)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Spring Branch Retrofit	NWET	49.5	276,473	97	88.3	19.6	5,821	12.1
Spring Branch SR	SR	(10,000)	1,868,380	97	2,020.0	107.0	35,800	142.8
Long Quarter Branch Ret	NWET	134.0	150,000	99	287.2	81.8	23,643	67.82
Long Quarter Branch SR	SR	(2,300)	564,581	99	464.6	24.6	23,643	74.01
Dulaney Valley Branch SR	SR	(1,700)	220,000	98	343.4	18.2	6,086	7.8
East Beaver Dam Run I	SR	(2,000)	372,000	00	404.0	21.4	7,160	14.0
Goodwin Run @ Padonia	SR	(700)	491,000	02	141.4	7.5	2,506	89.9
Hampton Branch	SR	(2,500)	630,000	04	505.0	26.8	8,950	21.9
Western Run@Ashland Ch	SR	(500)	365,675	04	101.0	5.4	1,790	3.1
Spring Branch II SR	SR	(2,500)	1,080,495	08	505.0	26.8	8,950	37.5
Projects Under Design or Construction								
Gypsy Lane Trib.	SR	(2,225)	500,000	10	449.5	23.8	7,966	-
East Beaver Dam Run II	SR	(1,600)	1,000,000	10	323.2	17.1	5,943	-
TOTALS		183.5 (26,025)	7,518,604		5,633	380	129,317	470.9
Proposed Projects in the Capital Budget								
Loch Raven Retrofit	RET		0*	12				
Loch Raven SR	SR		0*	12				

Abbreviations
 NWET: New Wet Pond
 RET : Retrofit
 SR: Stream Restoration
 *project is proposed but no funding secured

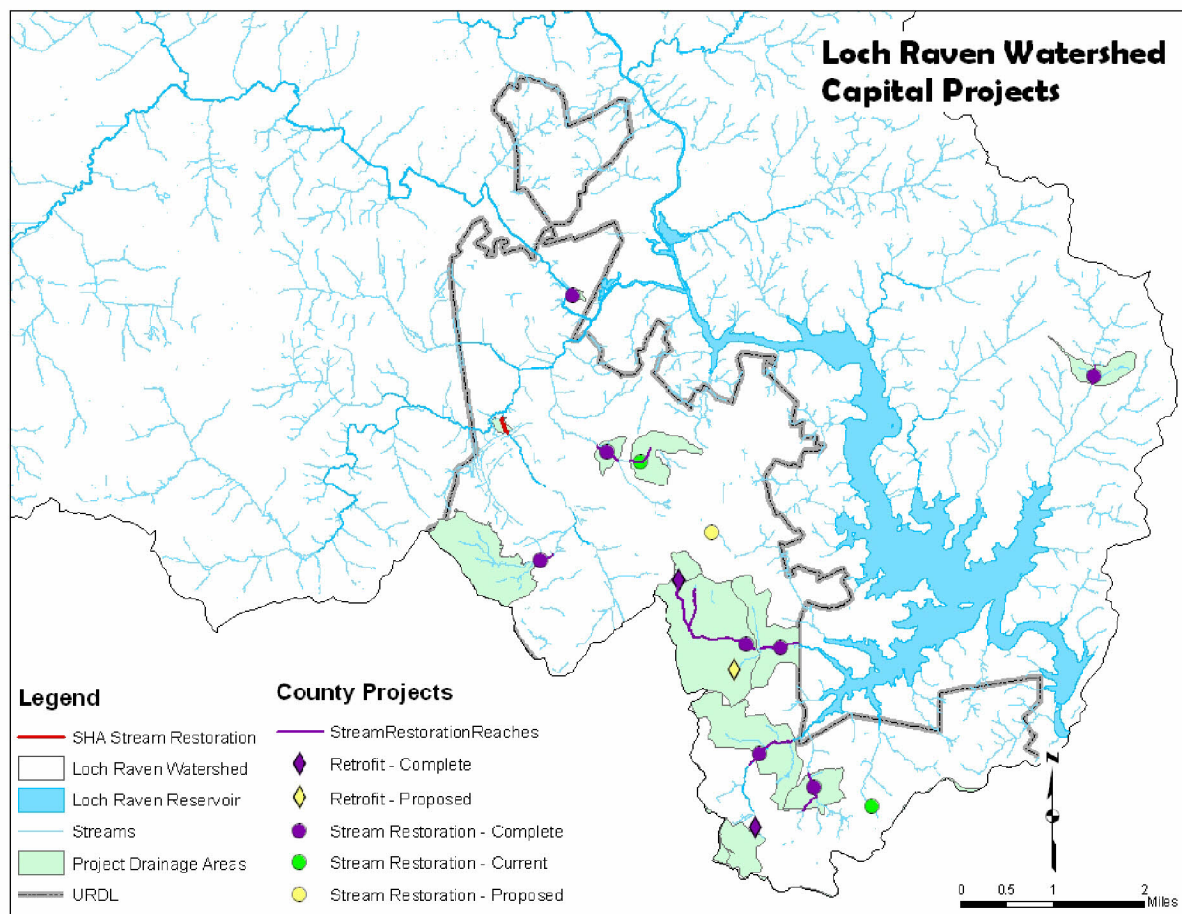


Figure 7-3 Capital Projects in the Loch Raven Watershed

To date eight stream restoration projects have been completed in the watershed and several additional stream restoration projects are in the Capital budget for the future years. The completed stream restoration projects have restored 22,200 linear feet of stream channel. In addition, over 3,500 linear feet of restored stream are currently in the design process.

Two new stormwater management wet ponds have been installed in the Loch Raven Reservoir watershed to date. These two facilities provide water quality and peak flow attenuation for a total of 183 acres of urban land. The resulting pollutant load reductions are displayed in Table 7-5. Additional retrofit and stream restoration projects yet to be identified are currently proposed in the capital budget but not yet funded.

To expand the County's overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant Program*. This grant program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

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The Gunpowder Valley Conservancy (GVC) geographically includes the Loch Raven Reservoir, Lower Gunpowder, Little Gunpowder, Gunpowder River and Bird River watersheds within their organization. The GVC applied for and received their fourth grant under this program. The organization intends to use the funds to expand their membership base, identify new volunteers, improve their web communication, organize tree planting and clean-up projects, engage citizens in Stream Watch, and conduct neighborhood outreach events. The GVC geographic range includes all of the Gunpowder Basin, therefore the restoration activities occur throughout the basin.

7.4.4 Lower Gunpowder Falls Watershed

The Lower Gunpowder Falls watershed exhibits a diversity of land uses. The portion south of the mainstem of the Gunpowder River is urban and is within the Perry Hall planned growth area, and the portion north of the mainstem is mainly agriculture and forest cover. The Lower Gunpowder Falls is listed by MDE as being impaired by heavy metals, nutrients, and as being biologically impaired. The *2008 Integrated Report of Surface Water Quality in Maryland* listed Lower Gunpowder Falls watershed as biologically impaired according to the new biological listing criteria, but removed the individual impairment listing for 12-digit watersheds.

A Water Quality Assessment for heavy metals was conducted in 2003 and submitted to EPA for approval indicating that the waters were not impaired by heavy metals. The document can be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_lowergunpowder_final_metals.asp

The *2008 Integrated Report of Surface Water Quality in Maryland* indicates that the Lower Gunpowder Falls is a high priority for development of a nutrient TMDL within the next two years. Maryland Department of the Environment is waiting on the final development of the Chesapeake Bay Model – Phase 5 prior to initiating the model for the Lower Gunpowder Falls TMDL development.

The Lower Gunpowder Falls Watershed Management Plan was completed in 1999. The development of a SWAP within the Lower Gunpowder Falls is not anticipated to take place for several years. The timing of the development of the SWAPs for the Lower Gunpowder will depend on the development of TMDLs for the watershed. Table 7-7 presents the status of the capital improvement projects in the Lower Gunpowder watershed. The locations of these projects are shown in Figure 7-4.

Table 7-7: Lower Gunpowder Falls Watershed – CIP Status

Capital Improvement Projects								
Lower Gunpowder River Watershed								
Project	Facility Type	DA (LF)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Minebank Run I	SR	(7,000)	1,189,684	00	1,414	74.9	25,060	222.9
Northwind @ Simms	REP	23.8	8,000	04	na	na	na	na
Minebank Run II	SR	(10,000)	4,400,000	05	2,020	107.0	35,800	156.7
Minebank LRHS Trib Retro								
Minebank Run Trib @Waller	SR	(482)	258,958	08	97	5.2	1,726	0.1
Gunpowder Falls @ Cromwell (DPW)	SR	(1,500)	2,500,000	09	303	16.1	5,370	0.2

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Projects Under Design or Construction								
Jennifer Branch	SR	(4,500)	3,000,000	10	909	48.2	16,110	54.2
Lower Minebank (D)	SR	(3,000)	1,350,000	10	606	32.1	10,740	
TOTALS		23.8 (26,482)	12,706,642		5,349	283.5	94,806	434.1
Proposed Projects								
Lower Gunpowder I	SR		1,047,000	10				
Lower Gunpowder II	SR		0*	10				
Lower Gunpowder III	SR		1,000,000	12				
Minebank Trib (D)	SR		0*	14				
Minebank Trib (C)	SR		400,000	16				
Total			2,447,000					
Abbreviations: REP: Repair SR: Stream Restoration D: Design C: Construction *project is proposed but no funding secured								

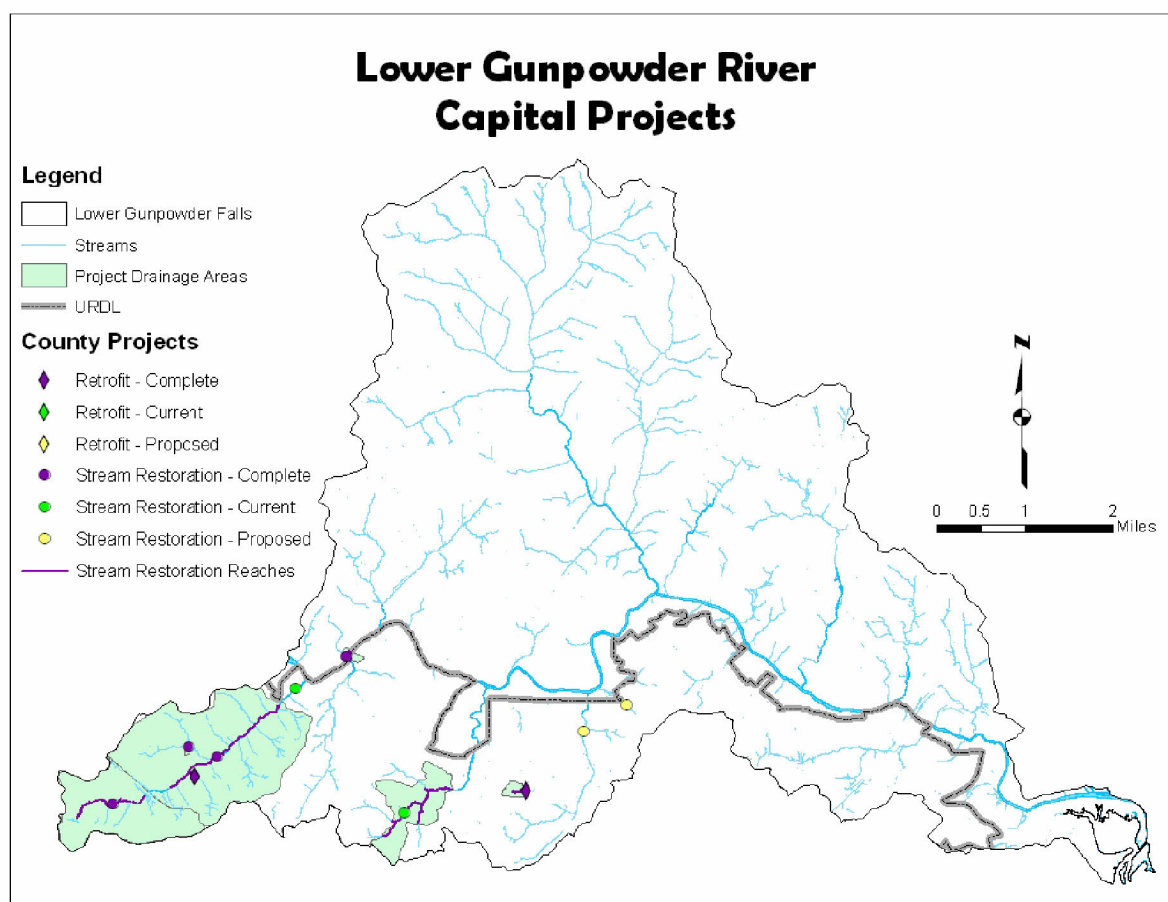


Figure 7-4 Capital Projects in the Lower Gunpowder River Watershed

Three stream restoration projects, which encompass almost the entire Minebank Run watershed, have been completed to date for a total of 17,000 feet of restored stream channel. The amount shown in the table above does not include the construction cost of a bridge that crosses the stream and needed repairs. Two additional stream restoration projects are currently in the design phase. The capital budget also includes funding for four future stream restoration projects.

7.4.5 Little Gunpowder Falls Watershed

The Little Gunpowder Falls watershed is located on the northeastern side of Baltimore County. The mainstem of the Little Gunpowder Falls serves as the boundary between Baltimore County and Harford County. MDE has previously listed Little Gunpowder Falls as impaired by heavy metals, nutrients, and as being biologically impaired. A Water Quality Assessment for heavy metals was conducted in 2003 and submitted to EPA for approval indicating that the waters were not impaired by heavy metals. The document can be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_littlegunpowder_final_metals.asp

The changes in the biological listing criteria in the 2008 *Integrated Report of Surface Water Quality in Maryland* resulted in Little Gunpowder Falls being delisted for biological impairment. A Water Quality Analysis (WQA) for nutrient impairment was submitted to EPA for approval in January 2009. With EPA approval of the nutrient Water Quality Analysis in August 2009, the Little Gunpowder Falls watershed will be placed in category 1 as meeting all water quality standards.

Currently, no capital improvement projects are under design or construction in this watershed as shown in Table 7-8. The Watershed Management Plan was completed in March 2002. There is relatively little urban land in the Little Gunpowder Falls watershed and consequently this watershed has fewer potential projects. The projects that were identified through the watershed management plan, while needed, have a lower priority when considered on a County-wide basis.

Table 7-8: Little Gunpowder Falls Watershed – CIP Status

Capital Improvement Projects Through 2008 Little Gunpowder Falls Watershed								
Project	Facility Type	DA	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
None								
Projects Under Design or Construction								
None								
Proposed Projects								
None								
Totals								

7.4.6 Bird River Watershed

The Bird River is listed as impaired for sediment and as being biologically impaired. A Water Quality Assessment for nutrients was conducted in 2005 and with EPA concurrence (May 9, 2005) was delisted as impaired by nutrients. The Water Quality Assessment can be found at:

http://www.mde.state.md.us/assets/document/Bird%20River%20WQA_final.pdf

The changes in the biological listing criteria in the 2008 *Integrated Report of Surface Water Quality in Maryland* resulted in Bird River being designated as having insufficient data to determine biological impairment. Therefore, the watershed has been placed into category 3 with regards to biological impairment listing until such time as there is sufficient data to make a determination.

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The Bird River Watershed Management Plan was completed in 1995 and was the first watershed management plan completed by Baltimore County. Much of the County's capital improvement work completed to date has been done in the Bird River watershed. Table 7-8 presents project status through calendar year 2009. A total of eight stormwater management facilities have been created or converted to water quality management to date. These facilities manage a total of 456 acres of urban land for water quality and peak flow attenuation.

A total of 30,000 linear feet of stream restoration has either been completed or is in the design phase in the Bird River Watershed. This number does not include the Maryland State Highway Administration stream restoration project on the White Marsh Run mainstem between Route 95 and Route 7, nor the Allison Transmissions stream restoration project below Route 7. Funds for an additional stream restoration project have been provided in the capital budget. Three additional stream restoration projects and one retrofit project are in the design phase. Table 7-9 details the capital improvement projects in the Lower Gunpowder watershed. The locations of these projects are shown in Figure 7-5.

Table 7-9: Bird River Watershed – CIP Status

Capital Improvement Projects Through 2008								
Bird River Watershed								
Project	Facility Type	DA (LF)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Burnam Woods	CNV	34.2	11,687	95	130.5	21.4	4,583	11.5
Featherhill	CNV	77.5	18,013	95	264.8	39.5	9,477	18.9
Lawrence Hill	CNV	52.5	102,091	96	180.0	24.7	4,437	10.2
N Fork WMR @ Perryvale	SR	(800)	120,000	99	161.6	8.6	2,864	3.3
Perryvale Retrofit	CNV	44.6	120,000	99	82.1	19.3	3,489	13.0
S Fork @ Franklin Square	NWET	32.2	935,416	99	55.1	15.7	1,663	13.3
White Marsh Mall Retrofit	CNV	108.5	435,838	99	538.4	72.6	14,734	33.6
White Marsh Run SR	SR	(4,000)	982,387	00	808.0	42.8	14,320	48.9
White Marsh Bus. Comm.	RET	53.9	235,597	99	125.4	38.2	14,038	33.5
S Fork WMR SR	SR	(1,900)	391,803	98	383.8	20.3	6,802	22.5
N Fork WMR @ Slvr Mdw	SR	(400)	128,945	99	80.8	4.3	1,432	23.4
WMR @ Woodcroft	SR	(2,000)	700,000	00	404.0	21.4	7,160	60.9
Evergreen Pond Retrofit	CNV	52.8	40,828	02	50.0	12.5	2,247	9.1
N. Fork White Marsh Run	SR	(7,000)	1,239,140	04	1,414.0	74.9	25,060	37.5
East Br. Honeygo Run	SR	(4,000)	1,330,000	04	808.0	42.8	14,320	24.7
S Fork @ Franklin Sq SR	SR	(2,600)	600,000	04	525.2	27.8	9,308	98.7
S Fork WMR@ Kings Ave.	SR	(1,700)	800,000	09	343.4	18.19	6,086	21.1
Projects Under Design or Construction								
WMR @ WM Rd	SR	(5,280)	3,300,000	10	1,066.6	56.5	18,902	73.0
WMR @ Orbitan	SR	(300)	175,000	10	60.6	3.1	1,074	
N. Fork II West	SR		1,425,000	10				
Magnolia	RET		100,000	10				
TOTALS		456.2 (29,980)	13,191,745		7,482.3	564.6	161,996	557.1
Proposed Projects								
Bird River I	SR		0	14				

Abbreviations

CNV: SWM Pond Conversion

SR: Stream Restoration

* project is proposed but no funding secured

NWET: New Wet Pond

RET : Retrofit

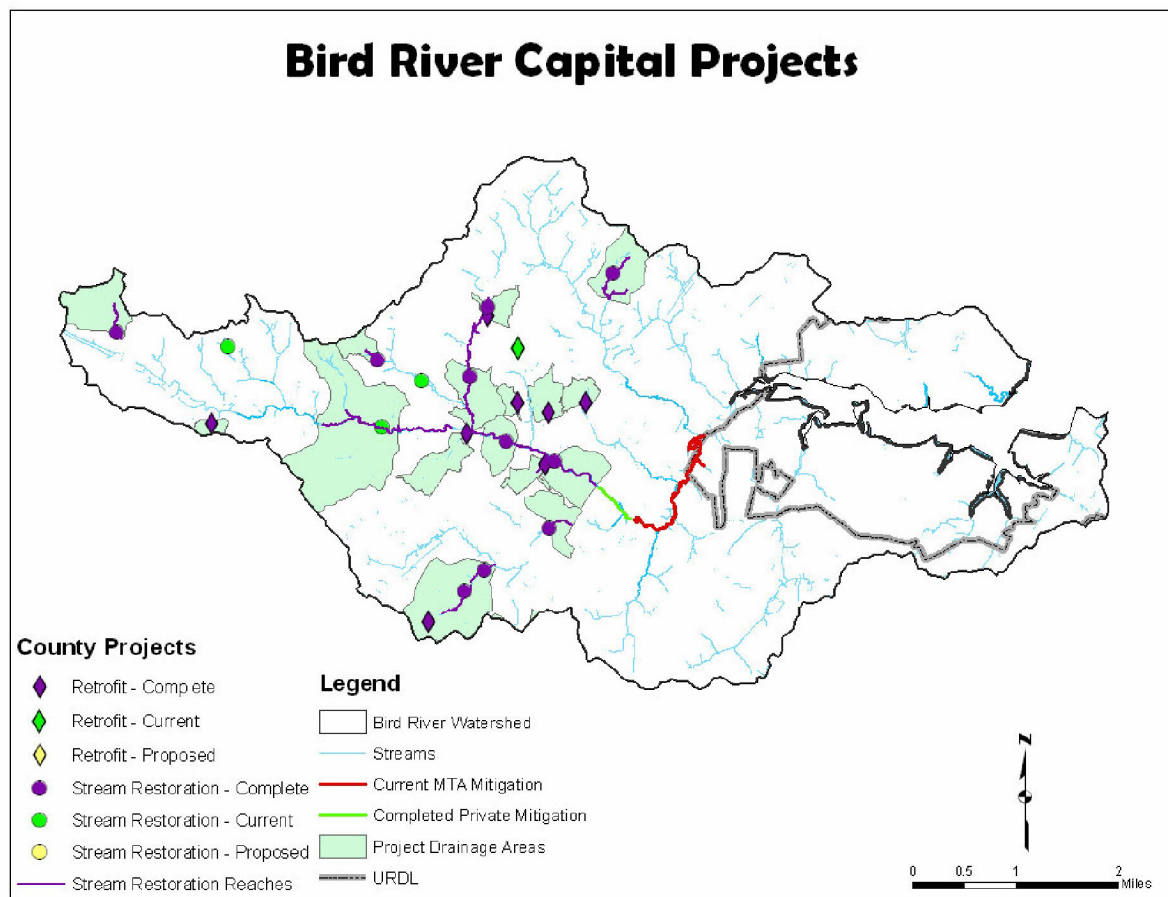


Figure 7-5 Capital Projects in the Bird River Watershed

7.4.7 Gunpowder River Watershed

The Gunpowder River tidal portion is listed as impaired for nutrients. The changes in the biological listing criteria in the 2008 *Integrated Report of Surface Water Quality in Maryland* resulted in Gunpowder River being designated as having insufficient data to determine biological impairment. Therefore, the watershed has been placed into category 3 with regards to biological impairment listing until such time as there is sufficient data to make a determination.

A watershed management plan is not required for the Gunpowder River watershed for the NPDES – Municipal Stormwater Discharge Permit due to the limited urban development. This is a ten square mile watershed and only two capital projects have been completed in the watershed. Table 7-10 details the capital improvement projects in the Gunpowder River watershed. The locations of these projects are shown in Figure 7-6.

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Table 7-10: Gunpowder River Watershed – CIP Status

Capital Improvement Projects Gunpowder River Watershed								
Project	Facility Type	DA (LF)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Carrollwood Park	RET	63.4	350,000	95	118.7	28.4	7,750	19.6
Carrollwood Shoreline	SE	(150)	150,000	92	20.5	13.5	56,160	6.0
Projects Under Design or Construction								
Seneca Retro-Carrollwood	ENH				na	na	na	
TOTALS		63.4 (150)	500,000		139.2	41.9	63,910	25.6
Proposed Projects								
None								
Abbreviations								
ENH: Enhancement				SE: Shoreline Enhancement				
RET: Retrofit								

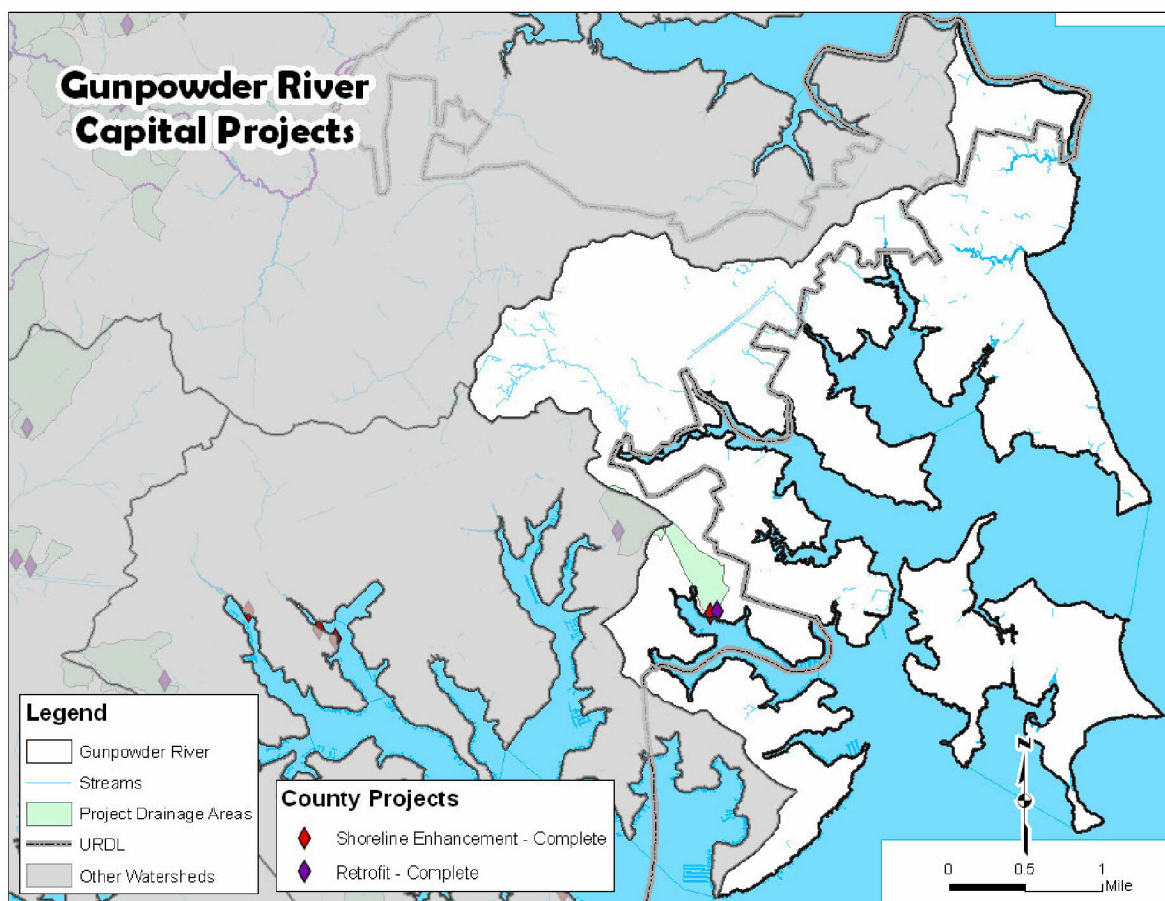


Figure 7-6 Capital Projects in the Gunpowder River Watershed

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7.4.8 Middle River Watershed

The tidal portion of the Middle River watershed is listed as impaired for nutrients and sediment. The changes in the biological listing criteria in the 2008 *Integrated Report of Surface Water Quality in Maryland* resulted in Middle River being designated as having insufficient data to determine biological impairment. Therefore, the watershed has been placed into category 3 with regards to biological impairment listing until such time as there is sufficient data to make a determination.

The Middle River Watershed Management Plan was submitted to Maryland Department of the Environment in 2001. Under DEPRM's Capital Improvement Program, dredging of many of the creeks within this estuary was completed in 2002. To fulfill the dredging permit requirements, a feasibility study was completed to identify potential retrofit sites.

Much of the capital improvement work that has been completed in the Middle River watershed consists of shoreline enhancement projects. A total of six shoreline enhancements have been completed. Four retrofit projects have been completed and two are proposed for the future. The revitalization efforts in the Essex community have provided opportunities for additional water quality enhancements. The Tall Trees project removed deteriorating apartment buildings and created a park. DEPRM used the opportunity to stabilize the stream channel and create a wet pond with an attractive fountain. Capital projects in Middle River are detailed in Table 7-11. The locations of these projects are shown in figure 7-7.

Table 7-11: Middle River Watershed – CIP Status

Capital Improvement Projects Middle River Watershed								
Project	Facility Type	DA (ft)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Turkey Point	SE	(1,000)	127,539	97	112.7	74.1	308,880	32.8
Sue Creek	STWET	21.9	93,274	97	40.9	9.8	2,656	6.9
Dark Head Park	SE	(780)	168,000	90	426.2	280.2	1,167,600	124.0
Pottery Farm Park	SE	(1700)	351,000	95	190.5	125.3	521,914	55.4
Hawthorne Park	SE	(350)	64,000	95	39.1	25.7	107172	11.4
Dark Head Park II (repair)	SE	na	15,094	99	na	na	na	
Norman Creek	STWET	25.2	131,151	95	42.5	8.5	2,484	3.5
Tall Trees	SR	(1,000)	1,100,000 combined	06	202.0	10.7	3,580	38.5
Tall Trees	RET	135		06	602.8	71.4		
Frog Mortar	RET	66.1	82,000	08	120.8	28.3		18.3
Rocky Point Beach	SE	(1,110)	324,945	93	1,319.7	867.7	3,615,600	383.9
Projects Under Design or Construction								
None								
TOTALS		248.2 (5,940)	2,457,003		3,097.2	1,501.7	5,729,886	674.7
Proposed Projects								
Middle River Retros I	RET		350,000	10				
Middle River Retros II	RET		100,000	14				
Totals			450,000					
Abbreviations: SR: Stream Restoration RET: Retrofit * project is proposed but no funding secured								
SE: Shoreline Enhancement STWET: Stormwater Wetland								

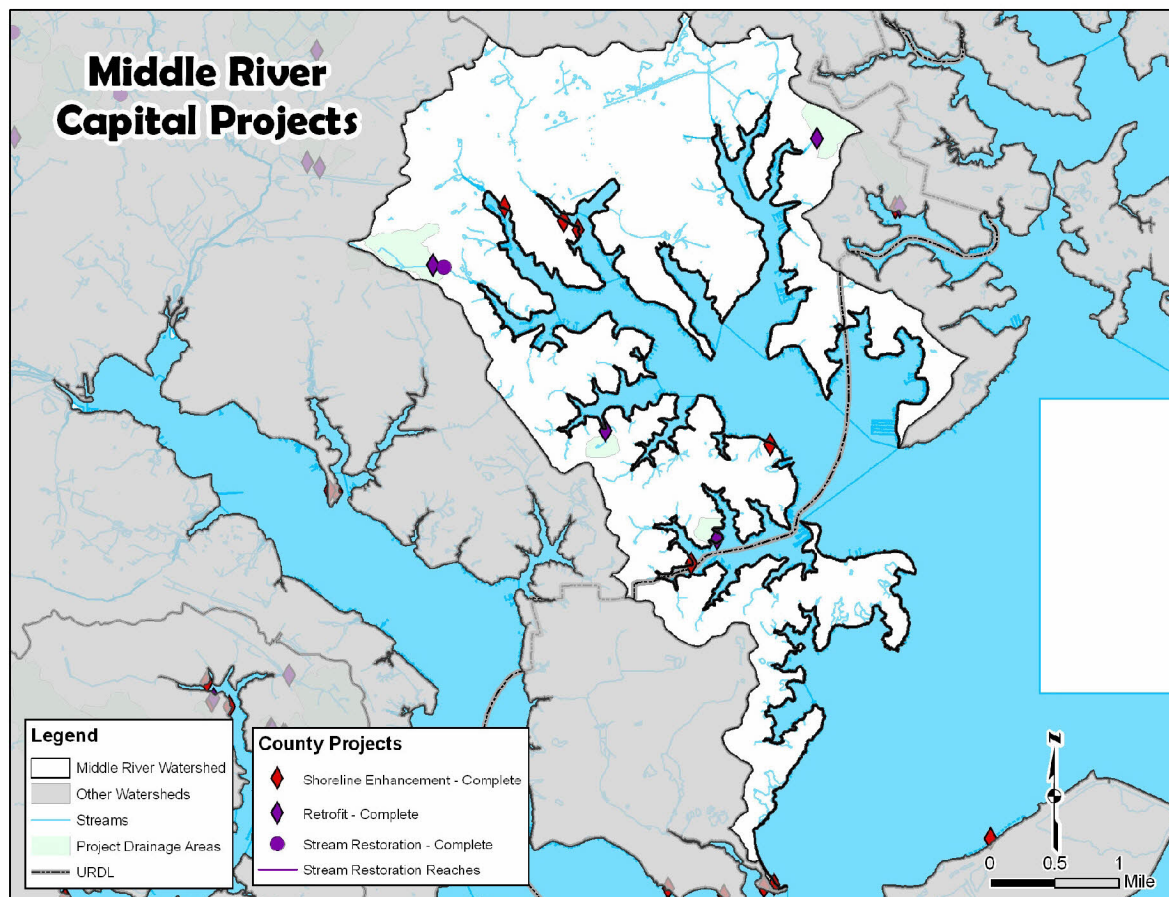


Figure 7-7 Capital Projects in the Middle River Watershed

7.5 Capital Restoration Projects – Patapsco/Back River Watersheds

The Patapsco/Back River Basin watersheds include: Liberty Reservoir, Patapsco River, Gwynns Falls, Jones Falls, Back River and Baltimore Harbor. Five of the six watersheds require watershed management plans based on the amount of urban development within the watershed.

7.5.1 Liberty Reservoir Watershed

The Liberty Reservoir is listed as impaired for nutrients, metals, sediment, bacteria, with some streams listed as being impaired biologically. A TMDL for mercury in fish tissue was prepared and submitted to EPA for approval in December 2002. The major source of mercury is from air deposition due to discharges from power plants and incinerators. As such, the major factor in reducing mercury contamination in Liberty Reservoir is reductions in emissions, with secondary actions including hazardous waste collection days and “e-cycling”. The document may be found on the web at:

http://www.mde.state.md.us/assets/document/tmdl/liberty/Liberty_main_pn.pdf

A Water Quality Analysis for chromium and lead was performed and submitted to EPA. EPA concurred (November 10, 2003) that no impairment by chromium and lead is occurring. The document may be found on the web at:

[http://www.mde.state.md.us/assets/document/Liberty%20Reservoir%20WQA_final\(1\).pdf](http://www.mde.state.md.us/assets/document/Liberty%20Reservoir%20WQA_final(1).pdf)

The changes in the biological listing criteria in the *2008 Integrated Report of Surface Water Quality in Maryland* resulted in the entire Liberty Reservoir watershed being listed as biologically impaired. A bacteria TMDL for the Liberty Reservoir was approved by EPA December 2009. The document may be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_Liberty%20Reservoir_bacteria.asp

A nutrient TMDL for the Liberty Reservoir watershed is currently being prepared by MDE.

A watershed management plan is not required for the Liberty Reservoir watershed for the NPDES – Municipal Stormwater Discharge Permit due to the limited urban development. The Liberty Reservoir serves as a drinking water reservoir for portions of Carroll County, Howard County, Baltimore County, Anne Arundel County and Baltimore City. Much of the Baltimore County portion of the drainage area to Liberty Reservoir is under forest cover. While there are no planned capital improvement projects for this watershed, its importance as a water supply reservoir require that additional planning of preservation and reforestation activities be considered in the future.

7.5.2 Lower North Branch Patapsco River Watershed

The Lower North Branch Patapsco River watershed is listed as impaired for nutrients, sediment, and as being biologically impaired. The listing for nutrients is based on the Baltimore Harbor listing. The changes in the biological listing criteria in the *2008 Integrated Report of Surface Water Quality in Maryland* resulted in the entire Patapsco River watershed being designated as biologically impaired.

A Total Maximum Daily Load (TMDL) has been completed for nutrients, and was submitted to EPA on December 14, 2006 for consideration. The nutrient TMDL was approved by EPA in December 2007. This TMDL covers all of the watersheds draining to Baltimore Harbor. The TMDL has estimated that a 15% reduction in urban non-point source load will be needed, along with upgrades to the Patapsco WWTP to meet water quality standards for tidal Baltimore Harbor. The document can be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_baltimoreharbor_nutrient.asp

A Water Quality Analysis for metals was submitted to EPA and received concurrence in January 2005 with the exception of Herbert Run. Herbert Run will remain on Part 3 (waterbodies that have insufficient data to define the impairment status) of the 303(d) list with Cu as the impairing substance. The document can be found here:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_final_LNBPatapsco_metals.asp

A TMDL for bacteria was submitted and approved by EPA in December 2009. The document can be found on the web here:

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http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_Patapsco_LNB_bacteria.asp

A TMDL for sediments was submitted to EPA for review in September 2009. The document can be found here:

http://www.mde.state.md.us/programs/WaterPrograms/TMDL/Pub_Notice/TMDL_PN_Patapsco_LNB_sediment.asp

A Water Quality Analysis for phosphorus received EPA concurrence in September of 2009. The document can be found here:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_final_LNB_Patapsco_eutro.asp

A TMDL for sediments was submitted on to EPA in September of 2009. The document can be found here:

http://www.mde.state.md.us/programs/WaterPrograms/TMDL/Pub_Notice/TMDL_PN_Patapsco_LNB_sediment.asp

The Patapsco River Watershed Management Plan was submitted to Maryland Department of the Environment in 2000. Table 7-12 provides a summary of the capital improvement projects in the Patapsco River watershed. One retrofit and five stream restoration projects have been completed in the Herbert Run and Bens Run subwatersheds. A retrofit project was also completed in conjunction with the County's Department of Public Works. An additional stream restoration project is in the design and construction phase. A total of 4,750 linear feet of stream channel has either been restored or is in design to be restored. Figure 7-8 shows the locations of these projects. Additional funding for projects is allocated in the capital budget through FY2016.

A SWAP has been initiated in the lower urban portion of the Patapsco River watershed. One of the goals for this SWAP will be to reduce nitrogen and phosphorus urban non-point pollutant loadings by 15% through a combination of County actions and projects, and citizen and business actions. The SWAP's anticipated completion date is the end of 2011.

Table 7-12: Patapsco River Watershed – CIP Status

Capital Improvement Projects Patapsco River Watershed								
Project	Facility Type	DA (LF)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Bloomsbury (DPW)	RET	10.4	unknown	90	34.4	4.4		1.4
Herbert Run@ Selma Ave.	SR	(550)	227,000	00	111.1	5.9	1,969	38.5
Herbert Run @ Leeds Ave	SR	(300)	78,144	03	60.6	3.2	1,074	2.8
2203 Sulphur Spring Rd	SR	(200)	111,000	03	40.4	2.1	716	10.7
Halethorpe Streambank	SR	(100)	61,500	03	20.2	1.1	358	
Bens Run SR	SR	(2,000)	570,964	04	404.0	21.4	7,160	21.3
Bens Run Retrofit	STWET	81.4		04	173.5	49.1	3,150	41.4
Herbert Run @ Paradise Ave. – cd	SR	(1,000)	482,000	10	na	na	na	86.6

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Projects Under Design or Construction								
None								
TOTALS		91.4 (4,150)	1,530,608		844.2	87.2	14,427	202.7
Proposed Projects								
Patapsco I	SR		1,100,000	12				
Patapsco II (D)	SR		0*	14				
Patapsco Retrofit I	RET		0*	14				
Patapsco II	SR		700,000	16				
Patapsco Retrofit II	RET		200,000	16				
Totals			2,000,000					
Abbreviations SR: Stream Restoration STWET: Stormwater Wetland RET: Retrofit cd: Consent Decree requirement D: Design C: Construction * project is proposed but no funding secured								

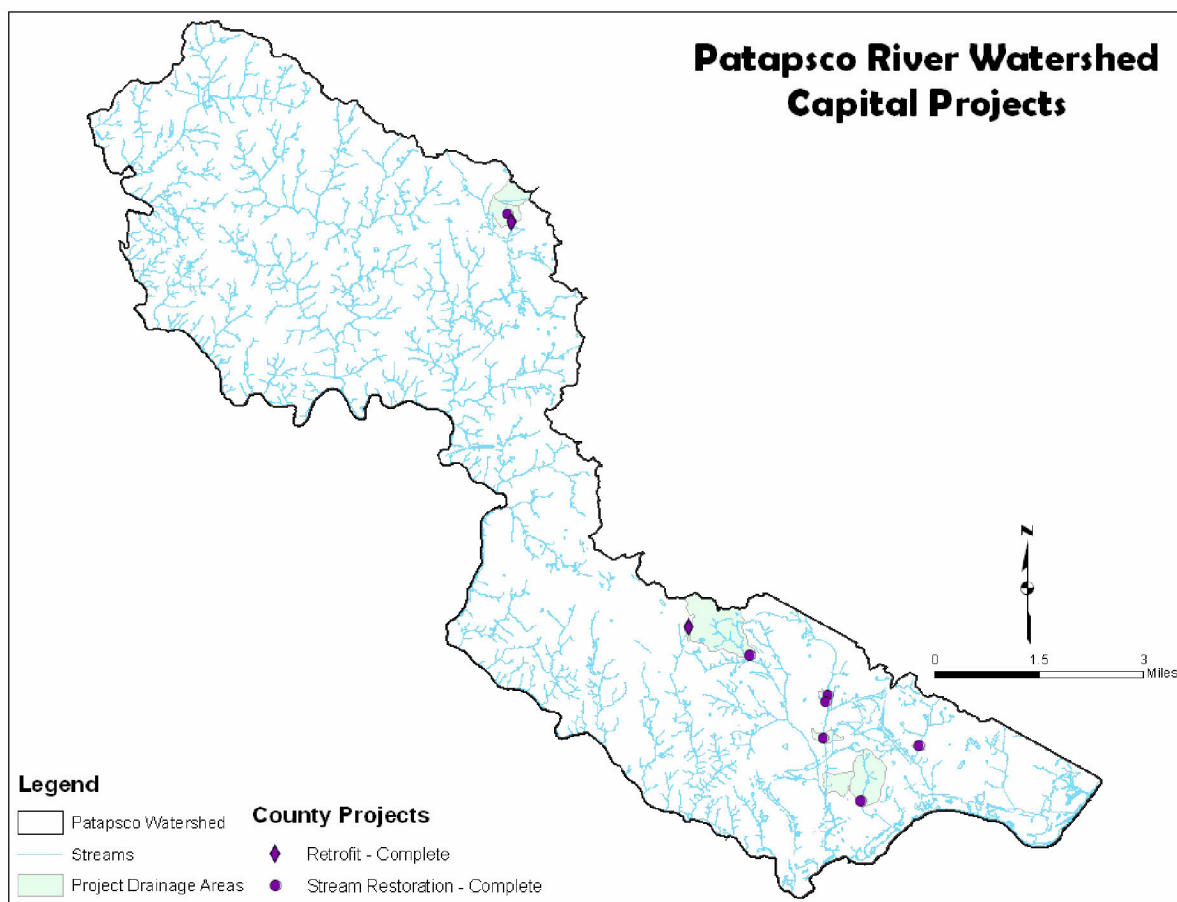


Figure 7-8 Capital Projects in the Patapsco River Watershed

To expand the County's overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant Program*. This grant program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects,

implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

The Friends of Patapsco Valley and Heritage Greenway (FPVHG) received their fifth grant under this program. The organization intends to use the funds to expand their base of volunteers, increase their membership, organize stream clean ups, engage citizens in Stream Watch, and outreach to schools and institutions.

7.5.3 Gwynns Falls Watershed

The County has completed the Gwynns Falls watershed management plan as a joint effort with Baltimore City and using the services of a professional consultant. Approximately two-thirds of the watershed is located in Baltimore County. Owings Mills, one of the County's two designated growth areas, is highly urbanized and located within this watershed. Table 7-12 displays the status of capital projects in the Gwynns Falls watershed.

A TMDL for nutrients has been completed for the Patapsco Basin, including Gwynns Falls. The TMDL identifies a 15% reduction from urban non-point sources as necessary to meet water quality standards in tidal Baltimore Harbor. The nutrient TMDL was approved by EPA in December 2007. The document can be viewed on the web at the location given under the discussion of the Patapsco watershed in section 7.4.2 above.

A TMDL for bacteria has also been developed for Gwynns Falls requiring a reduction in bacteria loads in the range of 98%. The bacteria TMDL was approved by EPA in December 2007. This document can be viewed on the web at:

http://www.mde.state.md.us/assets/document/GwynnsFalls_TMDL_071206_PN.pdf#TMDL_Georges_Creek_bacteria

A TMDL for sediments was submitted to EPA in September 2009. The document can be found here:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Pub_Notice/TMDL_PN_Gwynns_Falls_sediment.asp

Eighty (80) acres of unmanaged urban land have been addressed by enhanced stormwater management through conversion of existing stormwater management facilities or retrofits of uncontrolled urban discharge and another 200 acres will be addressed through two projects currently in the design phase. A total of 6,735 feet of stream restoration has been completed. A complete assessment of potential projects is underway for the Scotts Level Branch. This subwatershed was identified in the Watershed Management Plan and through staff discussions as a priority for DEPRM to identify and implement all feasible capital projects. Long term monitoring will be ongoing as well as an effort to quantify the water quality improvements. \$6,000,000 has been allocated for restoration within the Gwynns Falls in fiscal years 2010 through 2016. Table 7-13 details capital improvement projects in the Gwynns Falls. Locations of these projects are shown in Figure 7-9.

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Table 7-13: Gwynns Falls Watershed – CIP Status

Project	Facility Type	DA (LF)	Cost	Year	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
GF Trib @ Greenshire Ct	SR	(135)	17,690	99	27.3	1.4	483	3.7
Dead Run @ Security/McD	BE	(250)	23,690	02	na	na	na	
Rutherford Business Ctr.	CNV	46.2	134,000	03	26.1	7.0	13,188	27.4
Dead R @ HS Ftbridge/wall	SR	(200)	141,000	03	40.4	2.1	716	1.9
Woodlawn HS retrofit	RET/BE	10.4	206,000	03	40.8	6.9	1,399	3.9
Dead Run @ Whitehead 1	SCR	17.0	155,000	03	10.7	3.2		13.4
Dead Run @ Whitehead 2	SCR	7.0			4.3	1.2		5.2
DR @ Woodlawn Dr (Fox)	SR	(450)	232,594	04	90.9	4.8	1,611	22.9
Dead R @ Dogwood Rd	BE	(1,200)	Na	04	na	na	na	
GF @ Chartley SR	SR	(2,000)	970,000	06	404.0	21.4	7,160	13.7
Gwynns Falls @ Gwynnbrook - cd	SR	(2,500)	470,000	09	na	na	na	1.98
Projects Under Design or Construction								
Upper Gwynns Falls 5 Facilities	CNV	170	870,000	10				
Western Hills Ret	RET	33	250,000	10				
TOTALS		283.6 (6,735)	2,669,974		645.5	48.0	24,557.0	94.1
Proposed Projects								
Scotts Level Retrofit	RET		250,000	10				
DR @ West View Park	SR		1,500,000	10				
Scotts Level I	SR		1,550,000	10				
GF Retrofit	RET		220,000	12				
Dead Run I&II	SR		1,575,000	12				
Chartley II	SR		500,000	16				
Dead Run III (D)	SR		200,000	16				
Powder Mill (D)	SR		165,000	16				
Total			5,960,000					

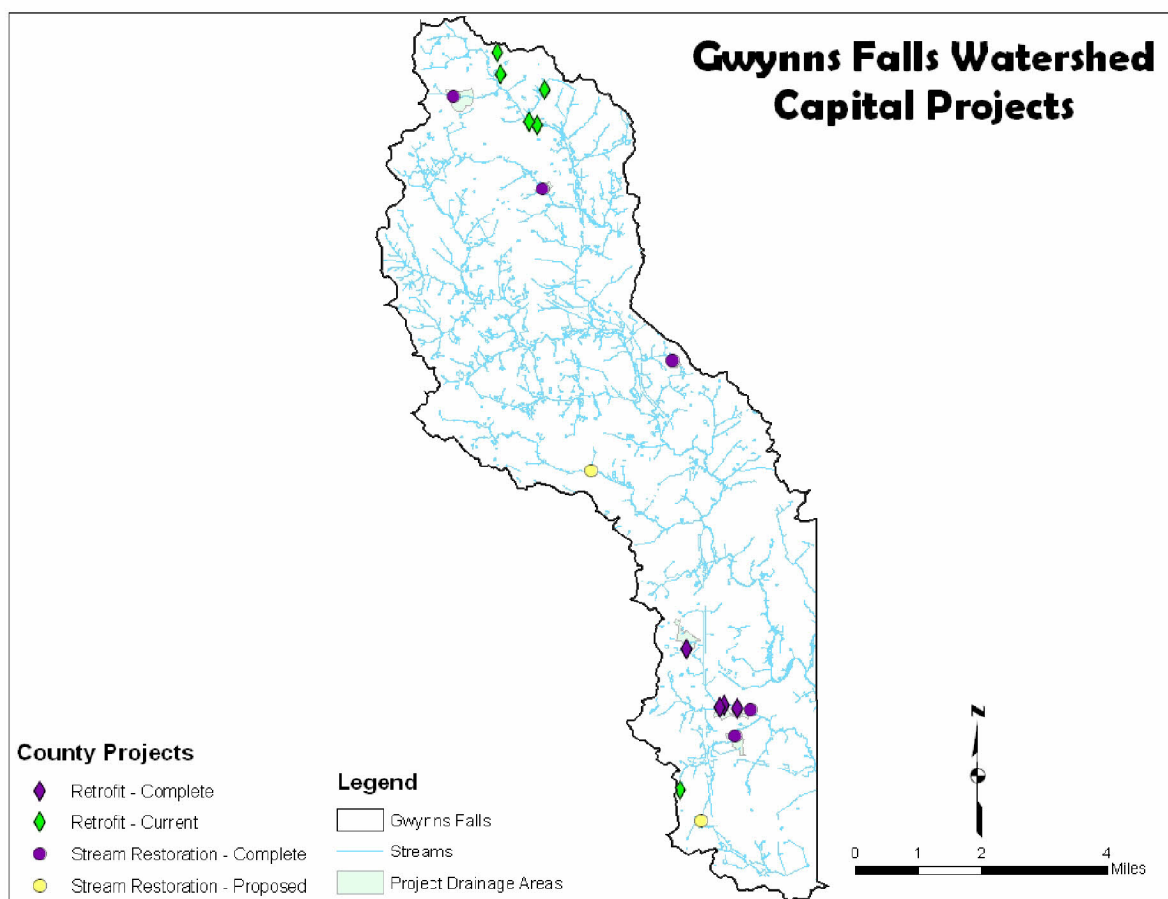


Figure 7-9 Capital Projects in the Gwynns Falls Watershed

To expand the County's overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant Program*. This grant program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

The Gwynns Falls Watershed Association applied for and received their third grant under this program. The organization intends to use the funds to expand their base of volunteers, increase their membership, organize stream clean ups, engage citizens in Stream Watch, and outreach to schools and institutions.

7.5.4 Jones Falls Watershed

A TMDL for nutrients has been completed for the Patapsco Basin, including Jones Falls. The TMDL identifies a 15% reduction from urban non-point sources as necessary to meet water quality standards in tidal Baltimore Harbor. EPA approved the nutrient TMDL in December

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2007. The document can be viewed on the web at the location given under the discussion of the Patapsco watershed in section 7.4.2 above.

A TMDL for bacteria has also been developed for Jones Falls and was submitted to EPA September 22, 2006. The bacteria TMDL for Jones Falls was approved in February 2008. This TMDL requires a reduction in bacteria loads in the range of ~95%. This document can be viewed on the web at:

http://www.mde.state.md.us/assets/document/Jones_Falls_TMDL_071706_PN.pdf

Water Quality Assessments were performed by MDE for zinc, copper, and lead. The analysis of zinc was performed first and received EPA concurrence on February 20, 2003. The document can be found at the first link listed below. EPA also concurred with the Water Quality Assessment for copper and lead on December 2, 2004 (second link). Both of these Water Quality Assessments found no impairment related to the heavy metals considered.

[http://www.mde.state.md.us/assets/document/Jones%20Falls%20WQA_final\(1\).pdf](http://www.mde.state.md.us/assets/document/Jones%20Falls%20WQA_final(1).pdf)

[http://www.mde.state.md.us/assets/document/Jones%20Falls%20WQA_final\(2\).pdf](http://www.mde.state.md.us/assets/document/Jones%20Falls%20WQA_final(2).pdf)

A TMDL for sediment was submitted to EPA in September of 2009. The document can be found here:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Pub_Notice/TMDL_PN_Jones_Falls_sediment.asp

The Jones Falls Watershed Management Plan was submitted to Maryland Department of the Environment in 1997.

Three outfalls with a combined acreage of 177 acres have completed retrofit projects to provide water quality improvement. A total of 16,550 linear feet of stream restoration has either been completed or is in the design phase. An additional retrofit and two stream restoration projects have been allocated in the future capital budget. Table 7-14 provides a summary of the capital improvement projects in the Jones Falls watershed either completed, in design or proposed. Locations of the completed or in-design projects are shown in Figure 7-10.

Table 7-14: Jones Falls Watershed – CIP Status

Capital Improvement Projects Jones Falls Watershed								
Project	Facility Type	DA (LF)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Lake Roland Ag BMPs	SR	(1500)	45,000	95	303	16.1	5370.0	
Moore's Branch @ Ltfoot	SR	(100)	25,000	96	20.2	1.07	35.8	
Robin Hood Cr. minor outf	RET	12.5	307,359	98	43.1	6.1	185	2.6
Kenilworth Park	DET	77.7		98	42.1	10.8	14,031	40.6
Orchard Hills outfall #149	DET	86.9		98	38.0	7.6	1,362	21.8
Rol. Run - Essex farm Rd.	SR	(250)		98	50.5	2.7	895	0.0
Roland Run – Sem. Ave.	SR	(150)	479,488	98	30.3	1.6	537	3.2
Towson Run – VFW Hall	SR	(600)		00	121.2	6.4	2,148	78.4
Roland Run – Jeffers Rd.	SR	(1,550)		02	313.1	16.6	5,585	68.0
Wood Valley	SR	(2,000)		04	404.0	21.4	7,160	27.3
Roland Run-Riderwd. Hills	SR	(2,400)	1,100,000	07	484.8	25.7	8,592	100.4

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Projects Under Design or Construction								
RoI Run @ Gspring	SR/RET	(3,500)	2,601,000	10	707.0	37.5	12,530	
Twsn Run @ Clsters	SR	(3,000)	1,150,000	10	606.0	32.1	10,740	
Roland Run @ Kellog	SR	(1,500)	823,642	10	303.0	16.1	5,370	
TOTALS		177.1 (16,550)	8,409,951		3,466	202	74,541	342.3
Proposed Projects								
JF Retrofits	RET		0*	12				
Slaughterhouse	SR		750,000	14				
Moore's (D)	SR		250,000	16				
Total			1,000,000					
Abbreviations SR: Stream Restoration DET: Detention Pond * project is proposed but no funding secured								
RET:Retrofit								

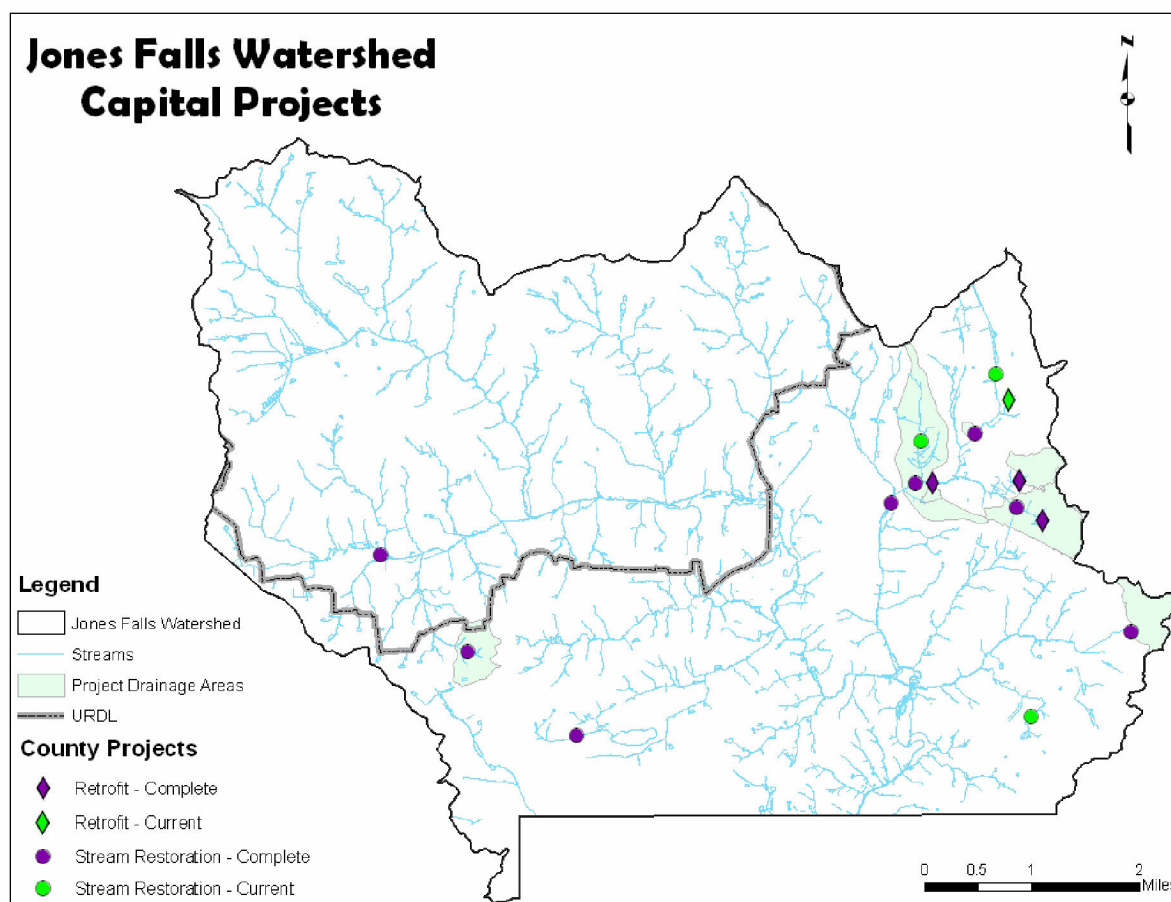


Figure 7-10 Capital Projects in the Jones Falls Watershed

In conjunction with Baltimore City a SWAP for the lower portion of the Jones Falls watershed was completed in the fall of 2008. It is available on DEPRM's web site at http://www.baltimorecountymd.gov/Agencies/environment/watersheds/ep_jonesmain.html. It was partially funded by EPA Region III through a Water Quality Cooperative Assistance Grant in the amount of \$200,000 for the creation of two SWAPs. The SWAP addressing the lower

portion of the Jones Falls includes the subwatersheds of Slaughterhouse Run, Moores Run, Western Run and the Baltimore City portion of the Jones Falls.

A SWAP for Northeastern Jones Falls is currently being developed. The SWAP will address the reductions of nitrogen and phosphorus loads necessary to meet water quality standards. It is anticipated to be completed in late 2010.

To expand the County's overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant Program*. This grant program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

The Jones Falls Watershed Association (JFWA) has received their fourth grant under this program. The organization intends to use the funds to expand their base of volunteers, increase their membership, organize buffer plantings and removal of invasive plants, engage citizens in Stream Watch, and outreach to schools and institutions.

7.5.5 Back River Watershed

A TMDL for nutrients has been completed for the Back River watershed and approved by EPA June 29, 2005. The TMDL identifies a 15% reduction from urban non-point sources as necessary to meet water quality standards in tidal Back River, along with nutrient reductions from the Back River WWTP. This document can be viewed on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_backriver_eutro.asp

In addition to the nutrient TMDL, MDE has developed a TMDL for chlordane (EPA approval December 17, 1999) and a TMDL for bacteria approved by EPA December 4, 2007. A Water Quality Assessment was performed for zinc (EPA concurrence December 23, 2004) indicating no impairment due to zinc. These documents can be viewed on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/tmdl_backriver.asp

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Pub_Notice/TMDL_PN_herringrun_bacteria.asp

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_final_backriver_zinc.asp

The Back River Watershed Management Plan was submitted to Maryland Department of the Environment in 1997.

Seven stormwater retrofit/conversion projects, addressing 1100 acres of drainage area, have either been completed or are currently in design. Eleven stream restoration projects addressing 12,000 linear feet of degraded stream channel have either been completed or are in the design phase. Table 7-15 provides a summary of the capital improvement projects in the Back River

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watershed either completed, in design or proposed. Locations of these projects are shown in figure 7-11.

Table 7-15: Back River Watershed – CIP Status

Capital Improvement Projects Back River Watershed								
Project	Facility Type	DA (LF)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Coxs Point I	SE	(220)	45,000	91	113.5	74.6	311,200	33.0
Coxs Point II	SE	(1,950)	295,000	95	1,388.2	912.8	3,803,352	403.9
Rocky Point Long Creek	SE	(1,370)	151,667	94	407.2	267.7	1,115,618	118.5
Lynch Point Cove – SM	ENH	36.2	250,000	95	na	na	na	11.0
Stemmers Run@ Dbl Rock	SR	(1,881) 680	362,905	97	380.0	20.1	6,734	156.5
Stemmers Run VFW	SCR		121,000	98				
Stemmers Run Garnet	SCR							
Stemmers Run BIO	RET							
Redhouse E.S. Retrofit	RET	53.4	136,794	98	90.1	19.6	4,041	12.0
Greenhill WQ Retrofit	SCR	10.4	35,273	98	5.3	1.3	1,781	4.6
Rocky Point @ Ballestone	SE	(2,000)	389,480	97	290.1	190.8	794,851	84.4
Redhouse Run Md-7	SCR	2.5	49,925	99	1.6	0.5	104	1.9
Briens Run @ Rossville Industrial Park	CNV	152.0	184,210	99	604.0	109.1	33,619	65.0
Herring Run (Wiltondale)	SR	(1,400)	295,860	99	282.8	15.0	5,012	118.2
Hart Miller Island	SE	(3,000)	338,000	99	353.0	232.1	967,075	102.7
Herring Run Bank Sta @ Weatherbee	SR	(100)	30,000	07	20.2	1.1	358.0	
Herring Run (Goucher)	SR	(300)	158,538	00	60.6	3.2	1,074	1.9
Redhouse Run @ Overlea Trib C	SR	(2,600)	529,260	01	525.2	27.8	9,308	20.8
Linover Park	SR	(1,000)	206,745	02	202.0	10.7	3,580	4.0
Rocky Pt. Habitat Creation	HAB	(690)	519,505	02	78.0	51.3	213,670	
BR @ Martin Blvd Interchange	NEXT	210.3	629,144	04			23,332	65.1
					335.5	39.8		
Linwood Avenue	SR	(500)	283,968	04	101.0	5.4	1,790	26.9
Glenwest	SR	(500)	203,220	04	101.0	5.4	1,790	47.4
Herring Run @ Sussex Rd.	Srepair	na	96,572	07	na	na	na	
Golden Tree Sec I	CNV	23.0	Dev paid	04	85.4	13.4		6.8
Golden Tree Sec III	CNV	15.7	Dev paid	04	56.7	8.6		4.1
BR Trash Boom	RET		80,000	10				
BR Trash Boom Maintenance	RET		40,000/yr	10-				
Her Run @Collinsdale-cd	SR	(2,000)	661,395	10	na	na	na	
Projects Under Design or Construction								
Rdhse Rn@ St. Pat Rd	SR	(2,000)	1,364,600	10	404.0	21.4	7,160	
Essex Skypark	SE	(2,500)	1,413,371	10	764	503	2,094,420	222.6
TOTALS		1,183.5 (24,011)	8,831,432		6,649.4	2,534.7	9,399,869	1,511.3
Proposed Projects								
Back River SWAP Rest.	RET/SR		210,000	10				
HR @ Overlook	SR		1,404,000	12				
Back River Retrofit	RET		250,000	12				
B&C WQ Enhancements	RET/SR		300,000	12				

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Bread & Ch Enhancements	RET/SR		400,000	12				
Bread & Cheese	RET/SR		100,000	14				
Redhouse -Belmar	SR		500,000	16				
Bread & Cheese	RET/SR		100,000	16				
Totals			3,264,000					

Abbreviations

CNV: SWM Pond Conversion

NWET: New Wet Pond

RET: Retrofit

SE: Shoreline Enhancement

cd-consent decree

ENH: Enhancement

SCR: StormCeptor

SR: Stream Restoration

HAB: Habitat improvement

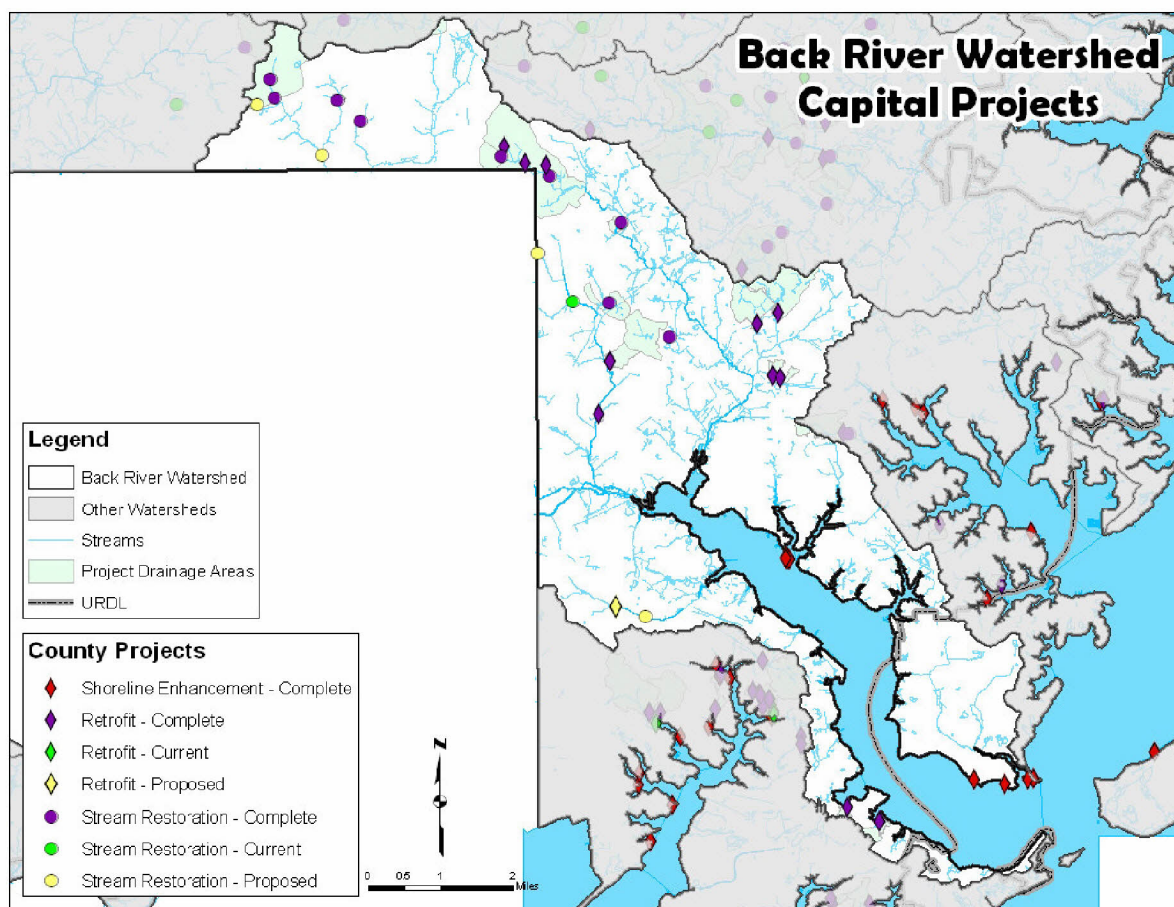


Figure 7-11 Capital Projects in the Back River Watershed

In conjunction with Baltimore City a SWAP for the upper portion of the Back River watershed was completed in the fall of 2008. It is available on DEPRM's web site at <http://www.baltimorecountymd.gov/go/backriver>. It was partially funded by EPA Region III through a Water Quality Cooperative Assistance Grant in the amount of \$200,000 for the creation of two SWAPs. One of these SWAPs was for Back River and includes fourteen of the upper subwatersheds.

The Tidal Back River SWAP was completed in February 2010 by Parsons Brinckerhoff. The document is also available at the link above and will be included on the disk accompanying this report under the ‘miscellaneous’ folder.

To expand the County’s overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant* Program. This grant program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

The Herring Run Watershed Association (HRWA) has received grants for four consecutive years under this. The organization intends to use the funds to expand their base of volunteers, increase their membership, organize street tree planting projects, organize stream clean up events, engage citizens in Stream Watch, and outreach to schools.

7.5.6 *Baltimore Harbor Watershed*

A TMDL for nutrients has been completed for the Patapsco Basin, including the Baltimore Harbor watershed. The nutrient TMDL was approved by EPA in December 2007. The TMDL identifies a 15% reduction from urban non-point sources as necessary to meet water quality standards in tidal Baltimore Harbor. The document can be viewed on the web at the location given under the discussion of the Patapsco watershed in section 7.4.2 above. In addition, a TMDL for chlordane (EPA approval March 23, 2001) has been developed. This document can be viewed on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/tmdl_baltoharbor.asp

A number of Water Quality Assessments have been performed in Baltimore Harbor resulting in the delisting of Baltimore Harbor as being impaired by zinc, lead, and chromium (EPA concurrence January 18, 2005). These documents can be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_final_harbor_Cr.asp

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_final_harbor_Zn_Pb.asp

The Baltimore Harbor Watershed Management Plan was submitted to Maryland Department of the Environment in 2001.

Nine stormwater retrofit/conversion projects have been completed to date along with eleven shoreline enhancement projects. The nine retrofit projects address 670 acres of urban development for water quality improvements. Table 7-15 presents the status of capital improvement projects through 2009. Locations of these projects are shown in Figure 7-12.

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Table 7-16: Baltimore Harbor Watershed – CIP Status

Capital Improvement Projects Through 2009 Baltimore Harbor Watershed								
Project	Facility Type	DA (ft.)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Concrete Homes	SE	(430)	65,000	90	133.4	87.7	365,452	38.8
Watersedge Park	SE	(480)	92,000	90	72.8	47.9	199,400	21.2
Merritt Point Park	SE	(1880)	175,000	90	128.5	84.5	352,000	37.4
Bear Creek I	SE	(475)	66,000	90	112.6	74.1	308,599	32.8
West Inverness	SE	(230)	19,000	90	14.1	9.3	38,800	4.1
Geise Ave.	SCR	1.5	unk	89	0.8	0.2		0.7
Chink Creek	RET	12.6	unk	90	23.4	5.5		3.8
Hughes Ave	SCR	17.6	unk	90	8.3	1.8		5.6
Charlesmont Park	SE	(750)	47,000	93	76.9	50.5	210,600	22.3
Sandy Plains Elem.	SE	(380)	108,000	98	82.7	54.4	226,568	24.1
Tabasco Cove	STWET	161.4	128,209	96	331.3	93.1	40,851	77.7
Battle Grove Park	SE	(420)	82,000	95	153.2	100.8	419,852	44.6
North Point Creek	NEXT	73.3	117,277	98	130.2	12.7	8,081	17.4
Schoolhouse Cove 8 SCR's	SCR	70.0	419,133	98	33.6	8.7	4,259	33.1
Bear Creek II Shore	SE	(700)	138,558	99	83.2	54.7	228,010	24.2
Bear Creek II SD Retrofit	NWET	11.0	93,026	99	22.5	6.0	1,672	4.7
Watersedge Park II (repair)	SE	(90)	21,062	99	na	na	na	
Lynch Cove Retrofit site-I	STWET	217	500,000 combined	03	465.7	117.2	3,565	86.0
Lynch Cove Retrofit site-II	STWET	109		03	248.4	68.7	3,565	55.5
Fleming Park	SE	(1767)	540,303	07	25.6	16.9	70,228	7.5
Projects Under Design or Construction								
Pleasure Island	SE	(3,100)	4,200,000	10	407.3	267.8	1,116,000	118.5
Battle Grove SCR	SCR		125,000	10				
Battle Grove II Ret	STWET							
Stansbury Park	STWET		20,000	10				
TOTALS		673.4 (10,702)	6,957,468		2,554.5	1,162.5	3,597,502	660.0
Proposed Projects								
None								
Abbreviations								
CNV: SWM Pond Conversion			NEXT: New Extended Detention Pond					
NWET: New Wet Pond			SCR: StormCeptor					
SR: Stream Restoration			SE: Shoreline Enhancement					
STWET: Stormwater Wetland								

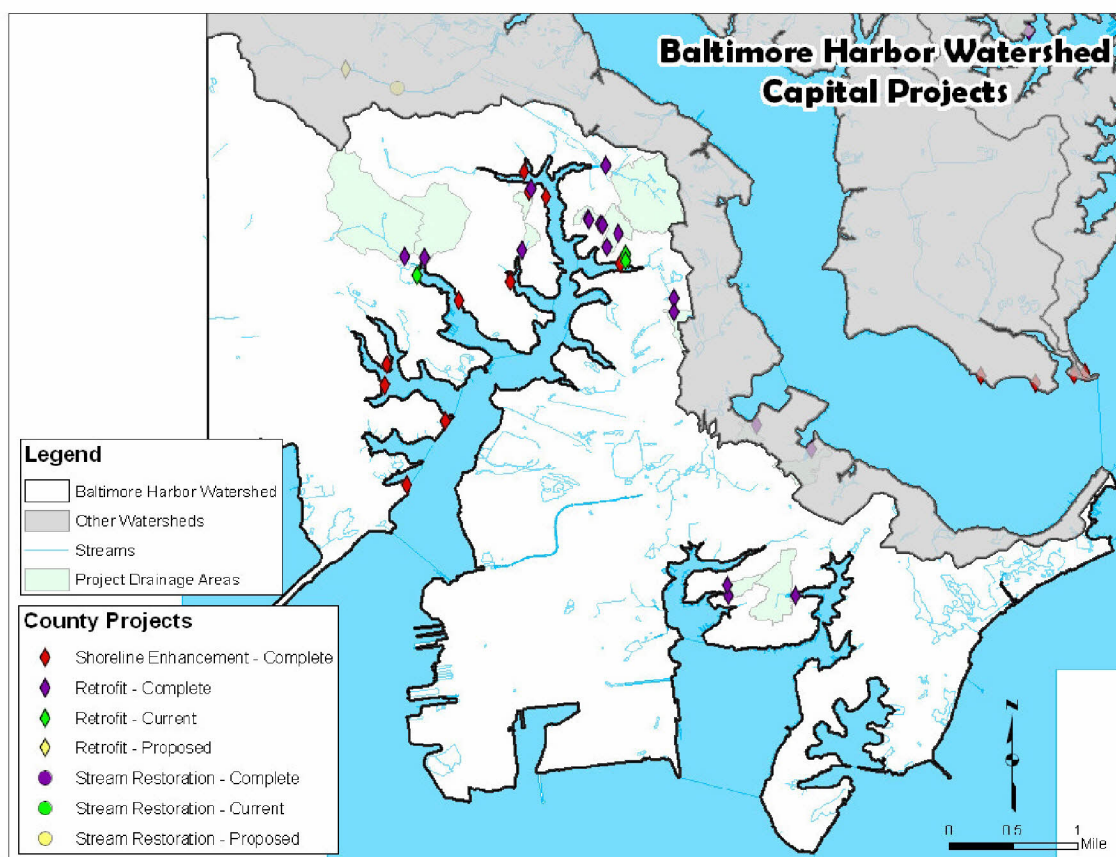


Figure 7-12 Capital Projects in the Baltimore Harbor Watershed

7.6 Community Reforestation Program

The Community Reforestation Program (CRP) was established by the Department of Environmental Protection and Resource Management to provide a dedicated workforce for planting, monitoring, and maintaining forest mitigation projects. The Program is funded through fees-in-lieu of mitigation for forests removed as a result of public and private land development, as required by the implementation of the County's Forest Conservation Act and Chesapeake Bay Critical Area Regulations. The CRP is the only full-time County-wide reforestation mitigation program among Maryland's counties.

The CRP includes a four-person reforestation crew that carries out year-round reforestation operations. The crew is based at a 1-acre site in eastern Baltimore County that is provided by the Department of Recreation and Parks. This home base houses a growing out nursery for 10 thousand tree seedlings; equipment and machinery needed for planting, monitoring, and maintaining the reforestation projects; and office space for the reforestation team.

Occasionally, the CRP will undertake special grant-funded projects to improve water quality and groundwater recharge, as well as wildlife habitat. The most recent example is the expansion of forest buffers and the reforestation of fields on private rural properties. To date, the CRP has reforested over 177 acres in 72 projects in urban and rural areas of Baltimore County. Despite weather fluctuations, ever-present deer and vole predation, and other natural and human stressors, the Program has maintained a strategy of flexibility in matching species selection,

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planting techniques, tree protection equipment, and maintenance efforts to site characteristics. As a result the Program has experienced a steady increase in tree survival to the present 85+% in recent projects.

Table 7-17 shows an accounting by calendar year and Table 7-18 is a cumulative accounting through 2008 by watershed. Not all plantings are included in this accounting, however, as some represent reinforcement of an area already planted and/or accounted for. The calculation method for pollutant reduction uses a land use conversion from urban pervious to forest cover. An additional reduction efficiency is applied for trees planted within a riparian buffer. These methods are described in Section 7.3.4.

Table 7-17: Baltimore County Reforestation Projects by Calendar Year

Year	New Acres Planted	N Reduction (lbs/yr)	P Reduction (lbs/yr)
1996	11.5	175.4	14.3
1997	3.2	24.7	2.0
1998	3.4	21.9	1.6
1999	6.2	37.1	3.9
2000	5.8	43.6	3.6
2001	15.2	116.7	9.6
2002	13.6	95.7	7.5
2003	18.8	144.7	11.8
2004	16.5	126.4	10.3
2005	25.4	156.6	11.4
2006	19.4	114.6	8.1
2007	16.1	117.7	9.2
2008	10.1	76.7	6.2
2009	12.5	92.5	7.3
Totals	177.7	1,344.1	106.9

Table 7-18: Baltimore County Reforestation Projects by Watershed through 2009

Watershed	Acres Planted	N Reduction (lbs/yr)	P Reduction (lbs/yr)
Upper Western Shore			
Loch Raven	66.8	565.1	45.0
Lower Gunpowder	1.25	9.6	0.8
Bird River	5.5	42.9	3.5
Gunpowder	20.9	146.4	12.6
Middle River	4.4	33.5	2.7
Upper Western Shore Totals	98.9	797.5	64.6
Patapsco/Back River			
Liberty	1.0	7.7	0.6
Patapsco	38.8	250.3	18.8
Gwynns Falls	1.5	11.5	0.9
Jones Falls	13.7	97.3	7.7
Back River	9.4	72.4	5.8
Baltimore Harbor	3.0	23.3	1.9
Prettyboy	11.5	84.2	6.7
Patapsco/Back River Totals	78.9	546.7	42.4
Grand Totals	177.8	1,344.2	107.0

7.7 Volunteer Organizations

Baltimore County has several very active volunteer organizations whose mission is focused on enhancement of environmental resources. In an effort to expand their ability to organize and conduct restoration activities, DEPRM developed a grant program entitled, *Watershed Association Restoration Planning and Implementation Grant* program. This grant program was developed to keep permanent staff with the county's local Watershed Associations. The groups continue implementation of restoration projects and educational activities, and also participate in County restoration planning, support the Stream Watch program, and the money can be used to leverage additional grant funding. The grant program captures an accounting of the groups' efforts and then adds these restoration activities into the County's totals for meeting nutrient reduction goals. Annual funding for each group is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended each year. Table 7-19 below is the nutrient reductions by group and calendar year. Table 7-20 shows the total per year nutrient reductions by watershed attributable to the respective watershed groups' efforts.

Table 7-19: Watershed Associations' Projects Resulting in Nutrient Reductions

Watershed Group	Project	N Reduction (lbs/yr)	P Reduction (lbs/yr)
2006			
Gunpowder Valley Conservancy	Buffer Plantings	38.3	3.1
Herring Run Watershed Association	Rain Barrels	2.8	0.4
	Tree Plantings	1.4	0.1
Jones Falls Watershed Association	Buffer Plantings	15.3	1.3
	Tree Plantings	7.3	0.5
Friends of Patapsco Valley	Tree Plantings	3.6	0.3
2007			
Gunpowder Valley Conservancy	Buffer Plantings	57.4	4.7
	Rain Barrels	0.2	0.0
Herring Run Watershed Association	Rain Barrels	2.8	0.4
	Buffer Plantings	2.7	0.2
	Tree Plantings	0.2	0.0
Jones Falls Watershed Association	Buffer Plantings	13.4	1.1
	Rain Garden	1.5	0.1
Friends of Patapsco Valley	Buffer Plantings	11.8	1.0
	Tree Plantings	8.9	1.4
	Rain Garden	3.0	0.5
2008			
Gunpowder Valley Conservancy	Buffer Plantings	86.1	7.0
	Tree Plantings	11.7	0.8
	Rain Barrels	0.6	0.1
	Rain Gardens	0.2	0.0
Herring Run Watershed Association	Tree Plantings	3.5	0.2
Jones Falls Watershed Association	Buffer Plantings	66.6	5.5
	Rain Gardens	38.4	6.1
	Rain Barrels	1.5	0.1
Friends of the Patapsco Valley	Buffer Plantings	3.1	0.3
Gwynns Falls Watershed Association	Buffer Plantings	3.3	0.3
2009			
Gunpowder Valley Conservancy	Buffer Plantings	40.2	3.3
	Tree Plantings	27.7	2.0

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Watershed Group	Project	N Reduction (lbs/yr)	P Reduction (lbs/yr)
	Rain Barrels	4.2	1.0
Herring Run Watershed Association	Tree Plantings	10.5	0.7
Jones Falls Watershed Association	Buffer Plantings	19.1	1.6
	Tree Plantings	17.5	1.2
Friends of the Patapsco Valley	Buffer Plantings	7.7	0.6
	Rain Barrels	1.6	0.3
Gwynns Falls Watershed Association	Buffer Plantings	5.2	0.7
	Rain Barrels	0.2	0.0
	Rain Gardens	18.1	2.3
Totals		537.6	49.2

Table 7-20 Watershed Association Projects Nutrient Reductions by Watershed

Watershed	N Removed (lbs/yr)	P Removed (lbs/yr)
Loch Raven	266.6	22.0
Patapsco	39.7	4.4
Jones Falls	180.6	17.5
Back River	23.9	2.0
Gwynns Falls	26.8	3.3

7.8 Additional Restoration Efforts

7.8.1 Growing Home Campaign

The *Growing Home Campaign* provides a needed alternative for the control of urban non-point source pollution. There are approximately 130,000 acres of land within Baltimore County's urban area delineated by the County's Urban Rural Demarcation Line (URDL). Residentially zoned land covers approximately 100,000 of these acres. Overall only about 20% of the County's urban area is managed by stormwater facilities, half of which are older stormwater detention ponds providing no significant water quality functions. Additional significant acreage of residential development exists outside the URDL at lower densities. DEPRM's watershed water quality management plans have identified a relatively small number of feasible locations within the URDL for construction of stormwater water quality retrofits on public land. The Growing Home Campaign is one way the County is gaining stormwater benefits from private lands and includes a cost share component. Tables 7-21 and 7-22 show the number of trees purchased, their planting location by watershed and associated nutrient reductions obtained using a land use conversion from pervious urban land to forested land, assuming an average of 200 trees per acre (see Table 7-4).

Table 7-21: Number of Growing Home Trees Planted in the Upper Western Shore Basin

	Deer Creek	Prettyboy Reservoir	Loch Raven	Lower Gunpowder	Little Gunpowder	Bird River	Gunpowder River	Middle River
2006	25	4	195	70	11	36	0	16
2007	12	3	153	87	31	72	23	35
2008	16	11	192	95	25	26	0	37
2009	17	16	206	54	31	87	19	70
Total	70	34	746	306	98	221	42	158
N Red.	2.0	1.0	21.8	8.9	2.9	6.5	1.2	4.6
P Red.	0.1	0.1	1.5	0.6	0.2	0.5	0.1	0.3

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Table 7-22: Number of Growing Home Trees Planted in the Patapsco/Back River Basin

	Liberty Reservoir	Patapsco L. N. Br.	Gwynns Falls	Jones Falls	Back River	Baltimore Harbor
2006	0	19	34	43	58	2
2007	5	67	74	74	77	12
2008	2	49	48	149	84	37
2009	13	86	28	102	116	10
Total	20	221	184	368	335	61
N Red.	0.6	6.5	5.4	10.7	9.8	1.8
P Red.	0.0	0.5	0.4	0.8	0.7	0.1

Table 7-23 shows nutrient reductions achieved through the Growing Home campaign. These numbers are obtained using a land use conversion from pervious urban land to forested land, assuming an average of 200 trees per acre.

Table 7-23: Growing Home Trees Associated Nutrient Reductions

Year	Trees Planted	Acres Planted	N Reduction (lbs/yr)	P Reduction (lbs/yr)
2006	513	2.6	15.2	1.1
2007	725	3.6	21.0	1.5
2008	771	3.9	22.8	1.6
2009	855	4.3	25.1	1.8
Totals	2,864	14.4	84.1	5.9

7.8.2 Tree-Mendous Maryland Program in Baltimore County

Baltimore County continues to partner with the MD DNR to actively promote the Tree-Mendous Maryland Program. In 2009, DEPRM provided technical assistance and received requests for free delivery of 13 orders, totaling 256 trees. The Tree-Mendous Maryland program in Baltimore County continues to be a valuable component of the effort to increase urban, suburban, and rural forest cover in Baltimore County. During the course of the 39 planting seasons since the program has been in existence, DEPRM has delivered approximately 13,000 trees in 522 orders requesting free delivery, serving school and neighborhood groups in hundreds of communities. Figure 7-13 below indicates the numbers of trees delivered by Baltimore County since program inception. Since 2004, DEPRM has been tracking the total number of Tree-Mendous trees ordered by Baltimore County groups versus the number delivered free by DEPRM. When tree orders that did not request free delivery are factored in for the years 2004 to 2009, the approximate number of Tree-Mendous trees planted yearly in the County remains at about 1,200 trees. Future reports will attempt to quantify the nutrient reductions from this program.

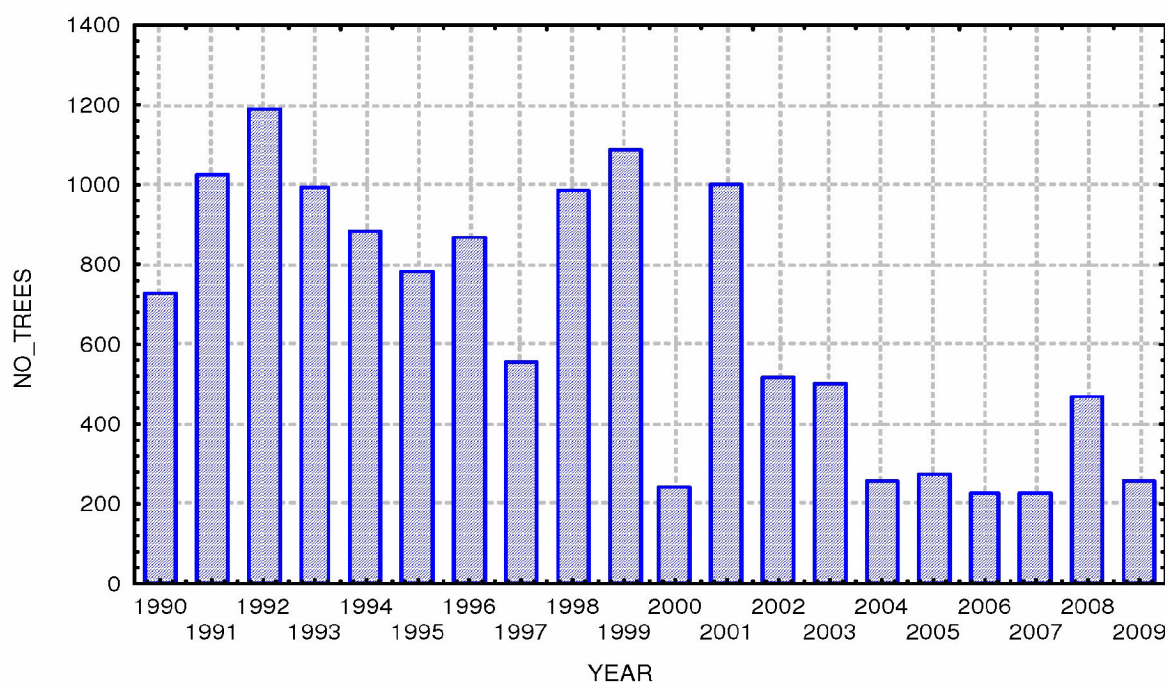


Figure 7-13: Number of trees obtained through the Tree-Mendous Maryland Program with technical assistance and free tree delivery by DEPRM between 1990 and 2008.

7.8.3 Big Tree Sale

DEPRM hosted its first Big Tree Sale on September 26, 2009. The majority of trees sold at this sale were five to seven feet tall. There were 161 trees sold. Future reports will attempt to quantify the nutrient reductions from this program.

7.9 Pollution Reduction Tracking System

The pollution reduction tracking database currently tracks reductions from capital construction BMP projects. It includes elements that are shown in the pollutant reduction tables in this section. In addition, pollutant reduction attributable to certain types of restoration (stream channel restoration and buffer planting) must continue to be monitored and updated. DEPRM's Spring Branch stream restoration project has provided data for a preliminary estimate of pollutant load reduction per linear foot of restored stream channel. The Chesapeake Bay Program has assigned a tentative pollutant removal efficiency of 25% for Total Nitrogen and 50% for Total Phosphorus and Total Suspended Solids for stream restoration, however DEPRM is currently using the linear foot reduction estimated from the Spring Branch project as described in section 7.3.1.

In addition, DEPRM currently tracks pollutant reductions for two of our tree planting programs; the Community Reforestation Program and the Growing Home Campaign as well as projects completed by local watershed associations. The removal efficiencies were developed following guidance from the Chesapeake Bay Program's removal efficiency numbers. DEPRM calculates planting projects using the land cover conversion rate from urban pervious to forest cover. An additional reduction is applied for trees planted within riparian buffers. These methods are described in Section 7.3.

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Existing stormwater management facility and retrofit pollution reductions are also tracked. Section 1.6 details the reduction associated with existing facilities and retrofits reductions are shown in the capital improvements tables in this chapter, sections 7.4 and 7.5.

Street sweeping and inlet cleaning also result in measurable pollutant reduction and these numbers are also part of the pollution reduction tracking system. Nutrient reductions associated with inlet cleaning and street sweeping are shown in Chapter 3, Tables 3-4 and 3-7 respectively.

7.10 Impervious Surface Calculation

The impervious surface acreage in previous reports was calculated by using a GIS planimetric building footprint data layer and a planimetric roadway data layer that was created from aerial photography flown from 1995-1997. Last year the data was updated using data layers generated from the 2005 aeriels. This year the data is updated again using data layers based on 2008 aeriels. The building data layer does not include sidewalks or driveways. The roads data layer includes parking lots. The data for 2005 and 2008 are presented by watershed in Table 7-24.

Using this methodology a total impervious coverage increased from 36,300 acres (1997) to 40,900 acres (2005) over the 8-year period. This represents ~575 acres of new impervious cover each year for the time period of 1997 – 2005. The impervious coverage increased by an additional 2,069 acres in 2008, or by ~690 acres per year.

Table 7-24: Baltimore County Impervious Area by Watershed – Changes Between 1997 and 2005

Watershed	Drainage Area (acres)	Total Acres Impervious 2005	% Impervious 2005	Total Acres Imperious 2008	% Impervious 2008
Upper Western Shore Watersheds					
Deer Creek	7,131	193.4	2.71%	231.5	3.25%
Prettyboy Reservoir	25,545	528.2	2.07%	562.7	2.20%
Loch Raven Reservoir	139,554	7,203.9	5.16%	7,536.0	5.40%
Lower Gunpowder Falls	29,471	2,474.4	8.40%	2,555.5	8.67%
Little Gunpowder Falls	17,229	702.4	4.08%	730.0	4.24%
Bird River	16,463	2,836.4	17.23%	3,058.4	18.58%
Gunpowder River	6,065	436.5	7.20%	469.9	7.75%
Middle River	6,520	1,442.2	22.12%	1,560.9	23.94%
Upper Western Shore Totals	247,978	15,817.4	6.38%	16,704.9	6.74%
Patapsco/Back River Watersheds					
Liberty Reservoir	17,555	685.5	3.90%	740.3	4.22%
Patapsco River	33,186	4,574.2	13.78%	4,779.3	14.40%
Gwynns Falls	28,643	6,989.6	24.40%	7,216.1	25.19%
Jones Falls	25,945	3,890.3	14.99%	4,059.5	15.65%
Back River	23,248	5,846.4	25.15%	6,137.8	26.40%
Baltimore Harbor	11,453	3,124.8	27.28%	3,331.9	29.09%
Patapsco/Back River Totals	140,030	25,110.8	17.93%	26,264.9	18.76%
County-Wide Totals	388,008	40,928.2	10.55%	42,996.9	11.08%

To meet the current NPDES permit requirement Baltimore County must provide restoration for impervious land areas that are equal to or greater than 20% of the County's urban impervious cover. Roads and buildings that are owned by the Maryland State Highway Administration and other state agencies, along with federally owned property, do not have to be addressed by Baltimore County. Therefore the roadways and building that are owned by the Maryland State Highway Administration, other state agencies, and the federal government were identified and

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the acreage of impervious cover associated with those were removed from Baltimore County's requirement. The results are presented in Table 7-25. The roadways and buildings owned by the state and federal government account for 4,712 acres of impervious area in Baltimore County or 11% of the total impervious area.

The stormwater management facilities installed through the development process account for 8,820 acres of impervious cover (see Section 1, Table 1-6). Advanced stormwater management facilities, or facilities that have little, or no opportunity for retrofits account for 5,114 acres of impervious cover. This impervious cover was subtracted from the amount of impervious cover that Baltimore County must address through restoration projects. The results are shown, by watershed, in Table 7-25

Table 7-25 calculates that Baltimore County is required to manage 10% of 33,171 acres, which equals 3,317 acres of impervious cover each 5-year permit term. Baltimore County is required to manage 20% of the county impervious area by June 2010. This is currently accounted for through the construction of restoration projects, and through street sweeping and storm drain inlet cleaning (see Section 3), and through reforestation, the Growing Home Campaign, and watershed association actions. Watershed management plans list specific potential projects that address water quality restoration. The capital budget provides funds on a watershed basis for implementation of the projects found to be feasible. The specific projects completed and currently under design or construction are listed in Tables 7-5 through 7-16 by watershed. Unidentified projects for each watershed are also listed by type.

Table 7-25: Baltimore County and Maryland State Highway Impervious Acreage

Watershed	Impervious Acres in Baltimore Co.	Impervious Acres owned by SHA	Impervious Acres Served by Advanced SWM	Remaining Impervious Acres
Upper Western Shore Watersheds				
Deer Creek	231.5	28.8	0.0	202.7
Prettyboy Reservoir	562.7	20.9	7.3	534.5
Loch Raven Reservoir	7,536.0	658.2	708.2	6,169.6
Lower Gunpowder Falls	2,555.5	204.8	291.6	2,059.1
Little Gunpowder Falls	730.0	86.7	34.9	608.4
Bird River	3,058.4	305.5	672.8	2,080.1
Gunpowder River	469.9	32.1	40.6	397.2
Middle River	1,560.9	286.0	129.1	1,145.8
Upper Western Shore	16,704.9	1623.0	1884.5	13,197.4
Patapsco/Back River Watersheds				
Liberty Reservoir	740.3	130.8	37.1	572.4
Patapsco River	4,779.3	733.5	494.0	3,551.8
Gwynns Falls	7,216.1	727.2	1,570.3	4,918.6
Jones Falls	4,059.5	477.5	427.7	3,154.3
Back River	6,137.8	569.7	636.8	4,931.3
Baltimore Harbor	3,331.9	450.0	63.7	2,818.2
Patapsco/Back River	26,264.9	3088.7	3,229.6	19,946.6
County-Wide Totals	42,996.9	4,711.7	5,114.1	33,171.1

The drainage areas for most of the completed projects and the associated impervious acreage have been delineated with the use of GIS. The drainage area for each CIP project that has been completed was delineated using topography or consultant information. An associated GIS data layer was created of all the CIP project drainage areas. The area of impervious surfaces within

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each digitized drainage area was measured. The total of these impervious surfaces was categorized by watershed and is included in Table 7-26.

The impervious acreage addressed by completed capital improvement projects is listed in Table 7-26. Baltimore County through its Capital Improvement Program has addressed 3,019 acres of its impervious acreage required under the current NPDES permit. This results in a total of 9.1% of the impervious area in the County addressed through capital restoration projects. Section 10 contains a complete accounting of pollutant load reduction and impervious acres addressed.

Table 7-26: Nutrient Reduction and Impervious Acreage Addressed by Completed Capital Projects

Watershed	Impervious Acres to be Addressed	CIP Impervious Area Addressed	Percent Impervious Addressed	#s Nitrogen Reduced	#s Phosphorus Reduced
Upper Western Shore					
Deer Creek	202.7	0	0.0%	0	0.0
Prettyboy Reservoir	534.5	0	0.0%	0	0.0
Loch Raven Reservoir	6,169.6	470.9	7.6%	5,633	380.0
Lower Gunpowder Falls	2,059.1	434.1	21.1%	5,349	283.5
Little Gunpowder Falls	608.4	0	0.0%	0	0.0
Bird River	2,080.1	557.1	26.8%	7,482	564.6
Gunpowder River	397.2	19.6	4.9%	139	41.9
Middle River	1,145.8	67.2	5.9%	3,097	1,501.7
Upper Western Shore Totals	13,197.4	1548.9	11.7%	21,700	2,771.7
Patapsco/Back River					
Liberty Reservoir	572.4	0	0.0%	0.0	0.0
Patapsco River	3,551.8	202.7	5.7%	844	87.2
Gwynns Falls	4,918.6	94.1	1.9%	646	48.0
Jones Falls	3,154.3	342.3	10.9%	3,466	202.0
Back River	4,931.3	546.2	11.1%	6,649	2,534.7
Baltimore Harbor	2,818.2	284.5	10.1%	2,555	1,162.5
Patapsco/Back River Totals	19,946.6	1469.8	7.4%	14,160	4,034.4
County-Wide Totals	33,171.1	3,018.7	9.1%	35,860	6,806.1

The recently developed SWAPs and those currently under development will provide information to determine the extent of the restoration options necessary to meet TMDL determined pollutant load reductions, and the Maryland Chesapeake Bay Tributary Strategies. At the same time these plans will satisfy the NPDES – MS4 permit to address impervious area. Table 7-27 presents the information of the impervious cover that will be addressed by these five plans.

Table 7-27: County Impervious Cover Addressed by the Current SWAPs

Planning Area	Status	County Drainage Area (acres)	Total Impervious Area	% County Imp. Area (total = 42,977)
Prettyboy WRAS	Complete	25,545	563	1.3
Lower Jones Falls SWAP	Complete	5,485	1,126	2.6
Upper Back River SWAP	Complete	15,395	4,529	10.7
Spring Branch SWAP*	Complete	1,006	187	0.5
Tidal Back River SWAP	Complete	7,720	1,540	3.6
Northeastern Jones Falls SWAP	In Development	7,463	1,747	4.1

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Loch Raven Reservoir Urban Southwest	In Development	17,522	3,345	7.8
Upper Gwynns Falls	In Development	13,618	2,856	6.6
Total		93,754	15,893	36.5

*The Spring Branch SWAP will become a part of the Loch Raven Reservoir Urban Southwest SWAP.

As can be seen from the Table 7-27, over 35% of the impervious area in the County will be addressed by these eight plans. As projects are implemented as prioritized through these plans or in other portions of the County, the impervious area addressed by those projects will be added to Table 7-26.